KNOWLEDGE

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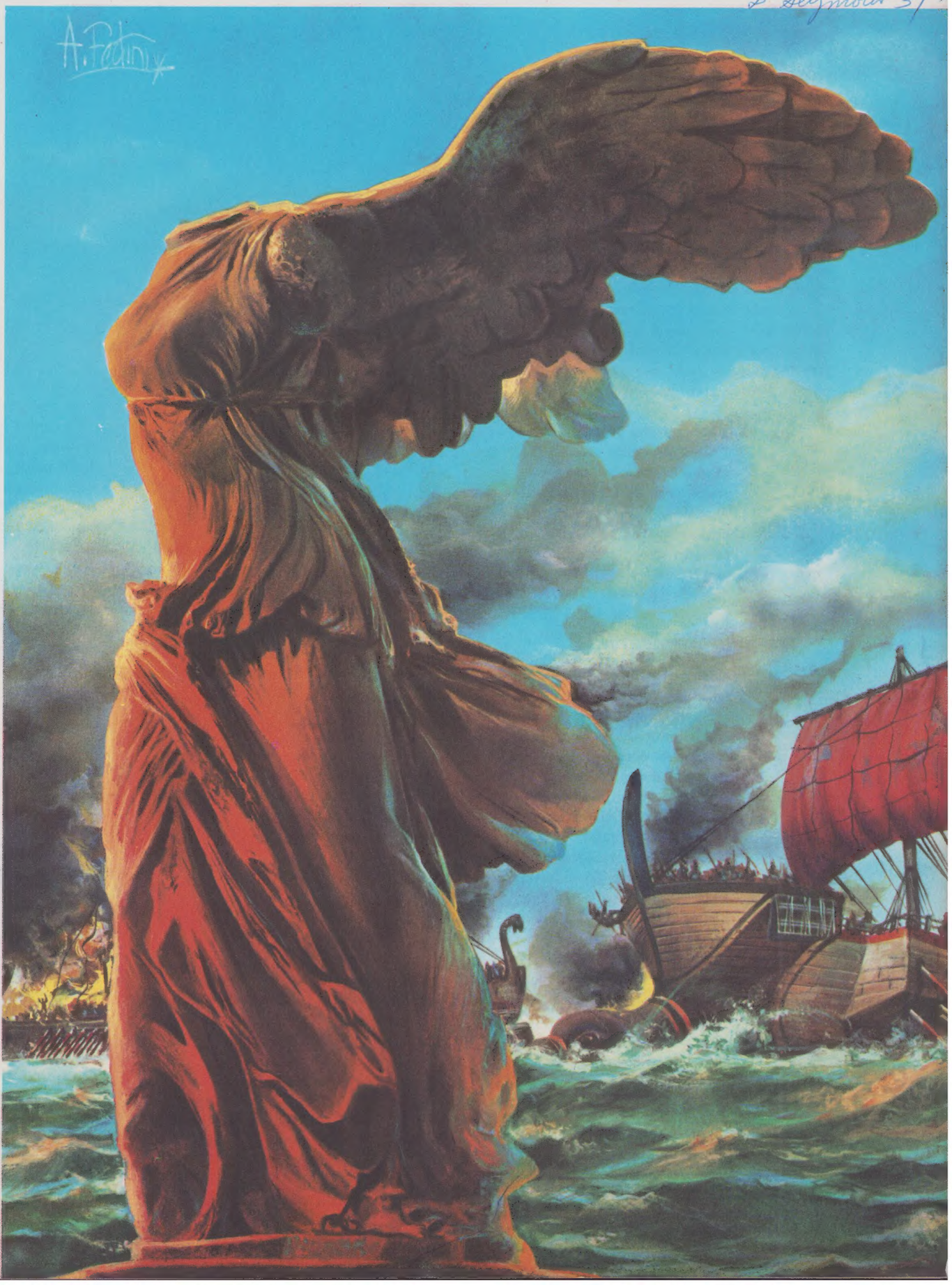

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S SCULPTURE (part one)

SCULPTURE is the representation of objects either in the round or in relief. We say that sculpture is 'in the round' when it is three-dimensional – made to be looked at from any direction. A 'relief', on the other hand, is not free-standing but is attached to a background base, from which it may stand out in varying depths.

If a figure stands out a long way from the background surface, it is said to be in high relief; while if it only just stands out, it is called a low relief, or, more commonly, by the French term *bas-relief*.

Two types of sculpture

There are two basic techniques a sculptor may use – modelling, and carving. The choice of technique must be closely related to the material he uses. Hard materials, like stone or wood, must be directly carved. The artist chips or cuts away the surplus material until he reveals the form he has in mind. Some of the greatest sculptors have worked in this way – like Michelangelo, who thought of his creations as being freed from the material that surrounded them. Modern sculptors, too, like Henry Moore and Barbara Hepworth, carve forms out of solid material, but believe very strongly in the idea 'truth to material'; that is, they are very much aware of the 'feel' and natural qualities (like grain and texture) of the material they carve, and for this reason their forms are simple in shape.

Other substances, however, like plasticine or clay, are soft and malleable. That is, they can be worked in the hand and modelled; pieces of material can be added to build up a finished whole. Modelling is a good method to use when a sculptor wants to make a quick, rough impression. Degas used to make little models out of wire, clay, or wax when he wanted to record quickly the movements of ballet dancers or horses.

Sculpture (1) *in the round*, (2) *in high relief, and* (3) *in low relief*

Casting a sculpture

Whereas carved sculpture is usually durable and long lasting, modelled sculpture is rather fragile. For this reason it is usual to transfer the final shape of a modelled piece of sculpture to a more permanent material such as bronze by means of a cast.

First of all, a cast is made in plaster of Paris. The original model is covered with a layer of the plaster; this is done in two or more pieces, so that when the plaster has set they can be separated and the plasticine or clay model cleaned out. The two pieces of plaster form a mould of the original modelled figure. They are coated with oil and soap, or shellac, to prevent the cast sticking, and put together again. Fresh plaster is poured into the hollow mould and allowed to harden. The mould is then removed, and there is the original modelled shape cast in solid plaster of Paris.

A mould of damp sand is now made round the plaster cast. The mould is then baked to harden it. Molten metal is poured into the mould; when it hardens the mould is removed and the cast is polished.

But casting a huge piece of sculpture in bronze is very expensive, and the cast is very heavy. For this reason hollow figures are often made. A rough mould of a plaster mixture, slightly smaller than the original, is placed inside the sand mould, and supported in it by cross pieces. Molten bronze is poured into the space between the sand mould and the plaster. When the bronze has hardened, the plaster is scraped out from it, and the sculpture can be polished up.

Another method used for making hollow bronze casts is a 'lost wax' method. In this, a thin layer of wax is put round the plaster cast before the outer mould of sand is added. The wax is then melted away, leaving a thin air space between the mould and the cast. Molten metal is poured into it, and the outer mould and the plaster cast are removed. With this method, the finished cast is slightly larger than the original.

Making a marble copy

Quite a different method must be used to reproduce a plaster cast in stone or marble. This is done mechanically by a pointing machine, which measures the depth from any given point and transfers the measurement by means of a hole drilled in the marble block. When enough of these holes have been made, the remaining marble is cut away.

One advantage of this method of reproduction is that reproductions can be made which are larger or smaller than the original by setting the pointing machine to the necessary scale. Another is that skilled technicians are capable of making the copy.

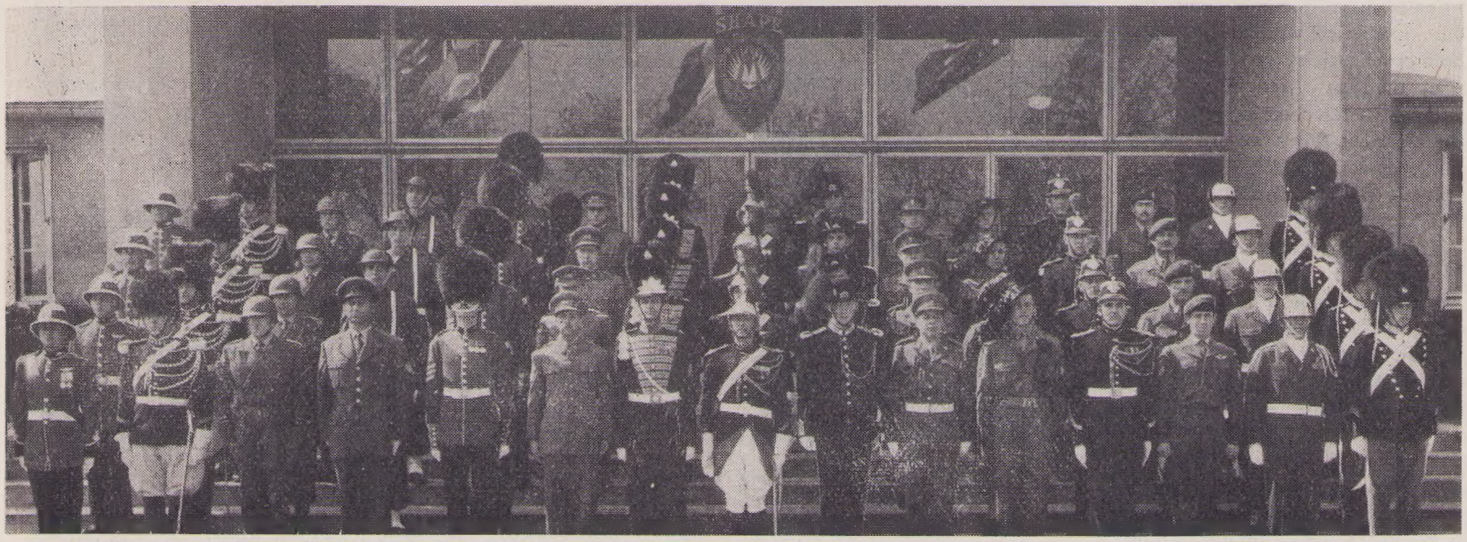
Although it is an advantage for skilled technicians to be able to copy marble sculptures, in the 19th century the technique of pointing was used so much that often the sculptor only made the original model, and never touched the marble. This led to the lifelessness which is characteristic of much 19th-century sculpture, and modern sculptors now insist on cutting the stone themselves.

Palaeolithic sculptured bison (Museum of National Antiquities, St Germain-en-Laye)

Previous page: During the Greek period sculpture reached a very high level. On the cover, a statue of Victory, which can be found at the Louvre. It was probably sculpted at the end of the 4th century B C to honour the memory of the Greek naval victories at Salaminia and Cyprus in 306 B C (shown in the background).

KNOWLEDGE NEWS
Week beginning 2nd June 1963

THE MIGHTIEST MILITARY ALLIANCE IN HISTORY



Troops of the 15 countries in NATO. From left to right: representatives from Canada, Belgium, Germany, Turkey, Britain, Portugal, Holland, France, Norway, Luxembourg, Italy, Iceland, Greece, the United States, and Denmark.

NATO

FOR days the world has been on edge; leaders of Communist and non-Communist blocs hurl denunciations and accusations at each other. Then negotiations are broken off, and Soviet tanks thunder into West German territory. . . .

Could this ever happen? The answer is probably not. One very good reason is that if the Soviet Union invaded West German territory, 14 other nations would retaliate – these nations are members of the mightiest military alliance in history, the North Atlantic Treaty Organisation, known as NATO.

On 4th April 1949 a treaty was signed by Britain, the United States, and other countries in the north Atlantic area, who declared that they would regard an attack against one of them as an attack against all.

So any invasion of a NATO member would mean the attacker would be faced by the combined military might of NATO – at full strength consisting of 6 million men; 630 long-range nuclear bombers, 1,550 medium-range bombers, and around 15,000 fighters and other aircraft; 246 submarines and 800 escort ships; 450–500 intercontinental ballistic missiles, and 250 medium-range missiles – the most powerful striking force of all time.

It is in many ways terrible that such a mighty force should exist, and everyone will be happy when it is possible to dismantle this mega-death-dealing instrument.

NATO was founded in a period when there was considerable hostility between the Soviet Union and the West. The Communist countries have a similar organisation, the Warsaw Pact. The Warsaw Pact forces would, at full strength, have nearly 8 million men, but their striking force would not be as effective as NATO. They could put into the field 200 long-range bombers, 1,400 medium-range bombers, and some 13,000 fighters and other aircraft; 457 submarines, 124 escort ships; over 75 intercontinental ballistic missiles, and 700 medium-range missiles.

Today all is not well with NATO. The biggest problem it has to face is that of its weapons of mass destruction – its *nuclear deterrent*. At present the United States controls the entire nuclear striking force of NATO: up to now Britain's nuclear force of V-bombers has not been a part of NATO. The decision to use it rests entirely with the President of the United States. However, other countries in NATO consider that they too should have a finger on the nuclear trigger and this problem will be a difficult one to solve. President de Gaulle of France is doing his best to acquire a nuclear force. He thinks that the Americans might not be prepared to defend Europe with nuclear weapons. Thus he considers that France should have a nuclear force which she can use whenever she wants – that is, an *independent nuclear deterrent*.

A solution to the problem might be a *multilateral nuclear force* – one force but controlled by three or four senior NATO members. However, de Gaulle has refused to join such a force. He says that France will go ahead with producing her own nuclear weapons, and control them independently of NATO.

There is also disagreement about the type of force which NATO should have.

The United States believes that NATO should have strong non-nuclear conventional forces as well as nuclear ones. She thus considers that NATO should increase its man-power and also the number of tanks, artillery, and other conventional weapons. The United States, who contributes 400,000 men to NATO, wants the other members to increase their contributions. De Gaulle is against increasing France's contribution of men – at the moment France has 40,000 men in NATO. Also the United States thinks that the other member countries should contribute more money to the upkeep of NATO.

Yet despite these disagreements, NATO is at this moment capable of dealing a blow that could wipe out a large proportion of the human race.

Who controls NATO?

NATO was founded in 1949 and comprises 15 countries: the United States, Canada, Britain, France, West Germany, Italy, Belgium, Holland, Luxembourg, Denmark, Norway, Iceland, Greece, Portugal, and Turkey.

Political control. The political side of NATO is controlled by the North Atlantic Council, a body in which each member country has a permanent representative. It meets in Paris at least once a week.

Military control. At the top of the command structure is the Military Council, based on Washington. It consists of representatives of Chiefs of Staff of the United States, Britain and France. It gives strategic guidance to the NATO Commanders: the Supreme Commander Europe (known as Saceur), the Supreme Allied Commander Atlantic (Saclant), and the Commander in Chief Channel (Cinchan).

Letter from the Editor

37 HERTFORD ST.
LONDON W.1

SOME of you are still not quite clear in your minds about the 4th alphabetical volume which will hold cover articles from A to Z.

In the first three alphabetical volumes we run completely through the alphabet. Then we do exactly the same with the 4th alphabetical volume, which will cover A–Z in 48 issues.

This volume will start with issue No. 145 with a subject whose first letter is A, and end with No. 192 with a subject whose first letter is Z. The third alphabetical volume will end with issue No. 144 with an article on Zoos.

Your Opinions Wanted

I remember that last year I asked readers of Black and Yellow *Knowledge* what they thought about *Knowledge News*. I had lots of interesting and helpful answers. I would like to do the same this year as well, and ask readers not only to comment on *Knowledge News* but on *Knowledge* as well.

What do you like about *Knowledge*? Is there anything you do not like? What sort of articles would you like to see more of or less of? Have you any new ideas for articles? Do you like the topical articles in *Knowledge News* – or do you prefer the puzzles and competitions? I hope that many of you will write and tell me what you think.

I will give £1 to the authors of the five best letters I receive.

John Chancellor

FACTORS

A word game

The following statements are either 'true' or 'false'. When one is 'true' score the *first* number, but if you think that it is 'false' score the *second* number. Change the numbers into letters (1=A; 2=B; and so on). Put these letters into the squares to make a five-letter word reading down the frame.

The river Chindwin is in Burma (18) – (13)

The laughing-jackass is a kind of kingfisher (8) – (21)

The International Registration Letters GE on the back of a car stand for Germany (19) – (25)

A fletcher was a maker of arrows (13) – (9).

In some country districts the mole is known as a want (5) – (3)

ANSWER

Rhyme
(The letter by which a car from Germany may be identified is D)

TALE OF TWO BRIDGES

Perched on a catwalk high above the waters of the Forth, spider-men spin out the steel cable for the main span of the new Forth Road Bridge, which will be completed this year.

LATER this year the first cars will roll across the new £18,000,000 Forth Road Bridge, and some 250 men who have braved all weather conditions to build it will stand back and survey their handiwork with justifiable pride.

It will be the biggest suspension bridge in Europe, with a main span of 3,000 feet – longer than Edinburgh's Princes Street, and into it will have gone 30,000 miles of wire cable – enough to circle the earth one-and-a-quarter times.

There is something almost noble about building a bridge, especially when it is a big bridge like this one. Perhaps that is why the new Forth Road Bridge is well ahead of schedule.

When it stands complete only half a mile upstream from its famous neighbour, the Forth Railway Bridge, there will be together two structures unrivalled in size in Europe.

But the comparisons in the building of the two bridges are quite startling.

The older bridge, the railway bridge, was completed in 1890. It took seven years to build. Over 4,500 men worked on it, and 57 of them were killed before it was finished. So far the new bridge has only claimed three victims.

The railway bridge was first assembled on land; the idea being that if it collapsed in its first tests, there would be as little loss of life as possible. When it passed the tests it was taken apart and reassembled over the Forth.

It was built well. It is strong enough to carry two heavy modern trains passing each other at high speed. On many other railway bridges, of much more modern construction, trains are required to slow down when crossing.

Work on the railway bridge never stops. It takes a permanent staff of 20 workmen three years to paint the mile-and-a-half structure from end to end to keep it free from rust. In the course of painting the bridge they use 50 tons of paint on its 145 acres of steel. And recently experts said that the main structure is good for another 140 years.

The new road bridge is, naturally, a much more streamlined affair. We have learned a lot more about bridge-building in the last 70 or 80 years.

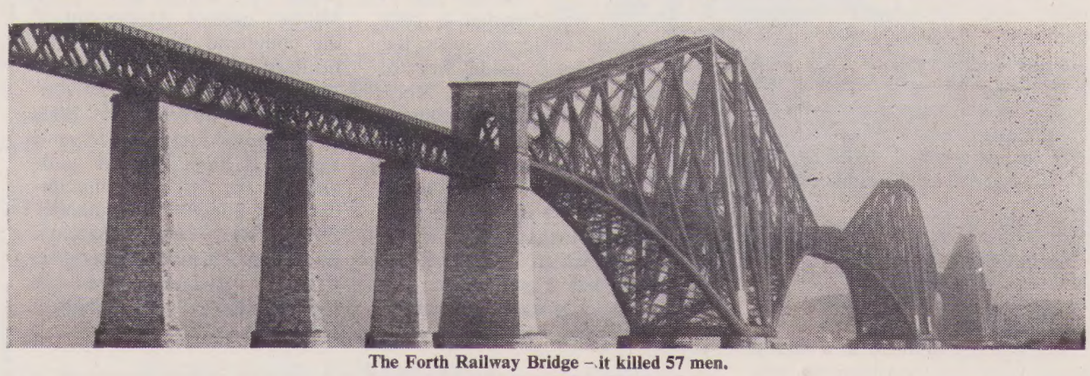
Once the two main 500-foot-high main towers were put up the trickiest part of the operation was spinning the 30,000 miles of cable over the often stormy Firth of Forth.

But it was done at an average of 300 miles a day. Each main cable consists of 12,000 strands bound together. As it was laid, the workmen, swaying on their giddy wire-mesh catwalks, examined each strand to make sure that it aligned exactly with the last one. An unplanned inch of sag could have weakened the whole structure.

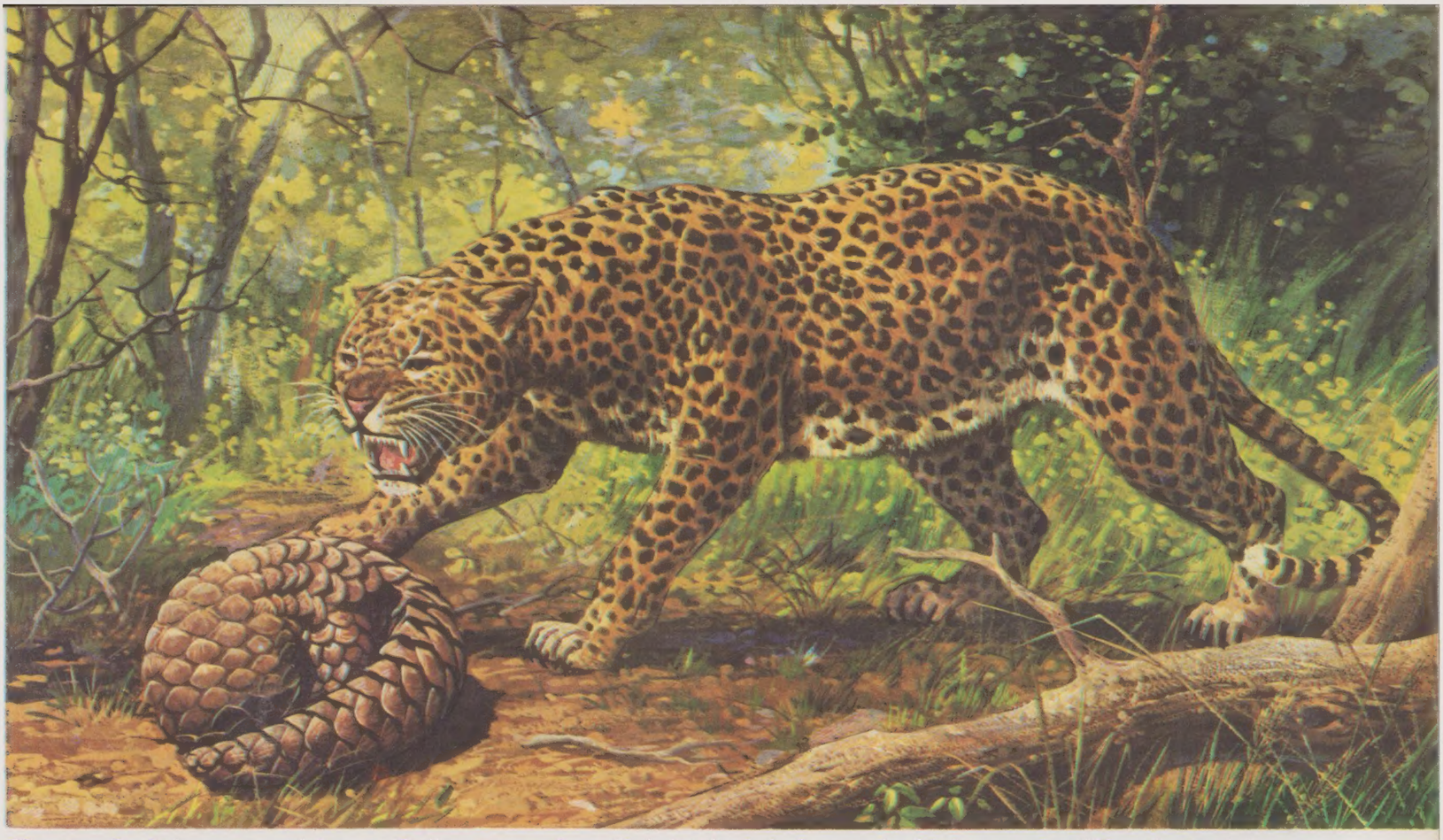
The enemy on this part of the job was wind. But the men went out in all weathers, even when high winds made their catwalks dance and swing sickeningly.

It was while this part of the job was being done that a man fell from the bridge. But he was not killed. Two of his workmates jumped after him, and managed to hold him up until the safety launch reached all three.

When the bridge goes into service, two toll gates will, it is hoped, enable it to pay for itself within 20 years; the toll charges for vehicles using it will be lower than the present ferry rates, and the bridge will stay open 365 days a year – even when hurricane-force winds sweep across the Forth.



The Forth Railway Bridge – it killed 57 men.



The pangolin feeds on ants and has no effective weapons of any kind, but its body is covered with horny scales. When threatened by an enemy, in this case a leopard, it curls up and trusts to its armour

METHODS OF ATTACK AND DEFENCE IN ANIMALS

ANIMALS are continually at war with each other but not for nearly such senseless reasons as those for which we attack our enemies. Nevertheless, a state of warfare does exist among animals, mainly because carnivorous animals have to hunt and kill their prey, and the prey obviously has to protect itself against being killed for food.

Creatures which hunt and catch their prey are called *predators*. It is obviously an advantage for a predatory animal to be swift, in order to overtake a fleeing victim, and strong enough to overcome its resistance when it is caught. But strength is not enough; it must be combined with weapons such as teeth and claws. The lion and wolf are animals of this kind. The predator may also use stealth instead of speed and lie in wait for its prey; in this case it must be coloured so that it is difficult to see, like the mantis on a bush or the python on the ground in the jungle.

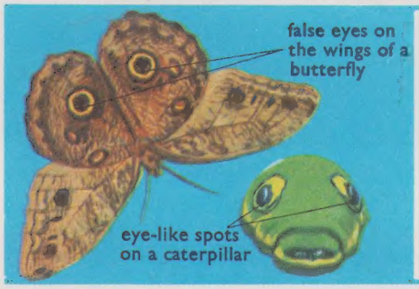
Speed, strength combined with weapons, and concealment also serve the needs of the hunted animals. Some of them, like the buffalo, are formidable in both attack and defence, but usually hunted animals are only equipped for defence. The spines of the porcupine and the poisonous hairs of some caterpillars are protective weapons. Most of the elaborate devices for concealment that we find in nature are displayed by animals which are defenceless and have to hide from their predatory enemies. Some of the most remarkable instances of this are found among insects. Some animals resort to sheer bluff; harmless snakes will rear up and hiss as if they were venomous. Some caterpillars have marks on their bodies like glaring eyes; birds may well mistake them for snakes and fly away instead of eating them.

A few typical examples of the many methods used by animals in attack and defence are shown on the next two pages.

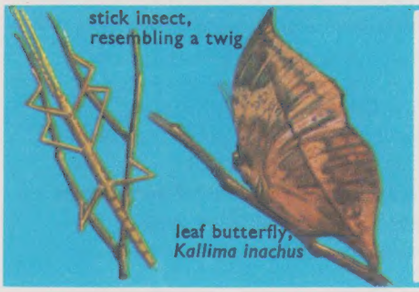
The porcupine's armour of sharp spines is purely defensive; it is very effective and few animals will attack this animal

METHODS OF PROTECTION

SPINES. Many animals are armed with an array of spines. These may cover the whole body, as with the sea urchin, or be confined to certain parts of the body. The hedgehog has spines on its back and curls up in a ball to protect its underparts.



BLUFF. Some insects have markings on their wings or bodies, usually like eyes, which serve to scare away predators.

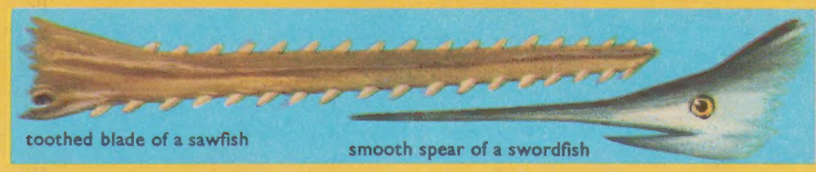


FORM AND COLOUR. Many kinds of insects are concealed by their resemblance to their surroundings.

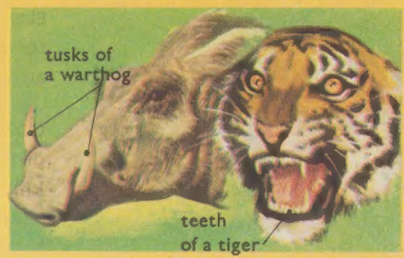
INFLATION. Some animals frighten away predators by blowing themselves up. Among them is the puffer fish.

HISSING. A hissing noise, made by forcibly expelling the breath, is made by quite a number of different animals as a means of frightening their enemies away. Most kinds of snakes hiss, and in the case of the poisonous ones the warning is genuine. That of a harmless snake is a pretence or bluff, but it may be very effective all the same. Among birds, owls hiss and snap their beaks if they are disturbed on their nests.

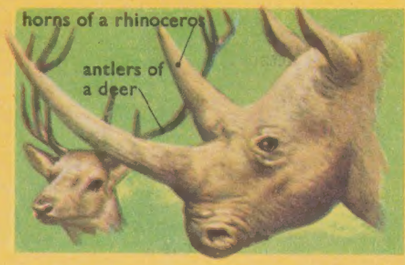
WAYS OF DEFENCE AND ATTACK



BLADES. Some fish, such as the sawfish and swordfish, have their snout prolonged to form a blade, which serves as a weapon.



TEETH AND TUSKS. All the carnivores (cats, dogs, bears, and related flesh-eating animals) use their teeth as weapons, and so do some kinds of pig.



HORNS. A great number of animals (cattle, goats, deer, rhinoceroses) are armed with horns or antlers, which are very effective weapons.

WAYS OF DEFENCE AND ATTACK BY MEANS OF POISON

POISON FANGS. The poison fangs of a snake are like the needle of a hypodermic syringe, and are used for injecting venom. Poison is a formidable weapon with which the snake can kill an enemy many times its own size. Only some snakes possess poison fangs; the majority are harmless.

The poison fangs of a viper

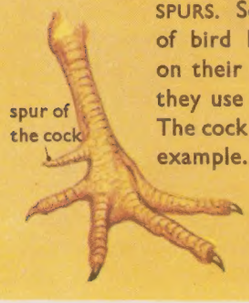
POISON JAWS. Spiders and centipedes have jaw-like structures in pairs which inject poison when they bite. The bite of some spiders is dangerous to human life.

POISONOUS STINGS. Bees, wasps, and hornets have a hollow sting at the tip of the abdomen, which is connected to a poison gland. It is used both in attack and defence.

POISON SPINES. Some kinds of fishes, such as the sting-ray and the weever fish, have terribly poisonous spines. The scorpion has a poisonous sting or spine on its tail.

Many carnivorous mammals and birds of prey have sharp claws on their feet, which they use as weapons of attack.

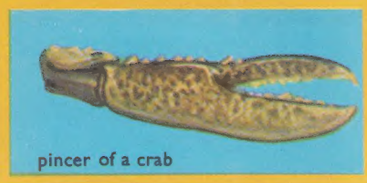
MANDIBLES. Many insects (beetles, ants, dragon-flies) have strong mandibles or jaws, which they use to catch their prey.



SPURS. Some kinds of bird have spurs on their legs which they use in fighting. The cock is a typical example.

BEAKS. The strong curved beak of birds of prey, and of parrots, is a formidable weapon.

PINCERS. Crabs and lobsters have front legs like pincers, with which they defend themselves and seize their food.



FEET. Animals with powerful legs often defend themselves by kicking. The kick of a horse is very dangerous; giraffes and ostriches also defend themselves in this way.

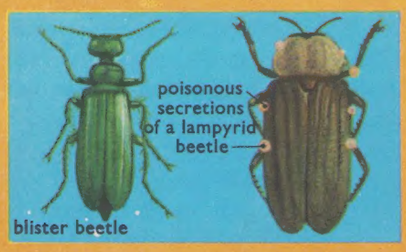
ELECTRIC SHOCKS. Certain fish, including the electric eel and the torpedo ray, can deliver an electric shock powerful enough to stun an enemy.

CONSTRICTING COILS. Some of the non-venomous snakes kill the animals on which they feed by coiling round them and squeezing them to death. A large python is strong enough to overcome a man.

A python squeezing an animal to death in its coils

POISONOUS SPURS. The platypus is an extraordinary animal in many ways. One of its unique features is a hollow poisonous spur on the hind leg.

POISONOUS AND IRRITANT SECRETIONS. Some kinds of toads produce an extremely poisonous fluid from glands in their skin. There are also insects which secrete powerfully irritant fluids; that of the blister beetle, *Lytta vesicatoria*, produces painful blisters if applied to the human skin, and it was formerly used in medicine.



IRRITANT HAIRS. The caterpillars of certain moths have irritant hairs, which are capable of producing a severe rash on the human skin. Among them are the caterpillars of the brown-tail and the pine processionary moths.

SPURTING BLOOD. The so-called horned toad (really a lizard) of the North American desert has the extraordinary habit of spurting blood from its eyes. It is assumed that this is defensive action.

REPELLENT SPRAYS. This is a form of chemical warfare. There are some mammals which can emit a spray of liquid so nauseating that no predator will attack them. The most famous of these is the American skunk; others are the teledu of Borneo and the African zoril.

EXPLOSIVE GAS. This extraordinary means of defence is employed by the bombardier beetle, *Brachinus crepitans*. When pursued, the beetle emits a corrosive fluid, which, because it is so volatile, explodes into gas in the face of the enemy.

STINGING FILAMENTS. Many *coelenterates* (jellyfish, sea anemones, and the like) have tentacles or filaments full of very small stinging cells called *nematocysts*. These have a paralysing effect on the animal's prey, fish and other creatures. The sting of some kinds of jellyfish is so severe that it can be fatal to a swimmer who accidentally comes into contact with one of them. Most of the dangerous species are found in tropical seas.

CLOUDS OF 'INK'. Some of the *cephalopod molluscs* (cuttlefish, squid, and octopus) can eject into the water a cloud of black, ink-like liquid and escape from an enemy under cover of it. This is rather like the smoke-screen used by warships.

A cuttlefish in the act of emitting a protective cloud of 'ink'

CLOTHES AND HOUSES OF THE ANCIENT EGYPTIANS

THE vivid paintings and sculpture of Ancient Egypt show us how Egyptian men and women dressed at different times in their long history of over 3,000 years. The hot climate called for clothes that were as brief and light as possible, and the peasants and workmen wore the same simple garments, waistcloths and short tunics, for centuries on end.

The short skirt or kilt of linen or cotton, held at the waist by a belt, was the basic garment for men, from king to labourer, and the foundation of all later styles (Figure 1). As time went by the skirt grew longer and wider, with a large triangular fold in front. Figure 2 shows a Pharaoh of the Old Kingdom (3100–2200 B C). By the period of the Middle Kingdom (about 2150–1780 B C) the front of the skirt was pleated and its outer edge had a gold border. In the New Kingdom (Figures 3 and 4) the skirt became a short-sleeved tunic, and rich men wore a long outer skirt of fine, transparent linen (1575–1200 B C); the inner skirt developed into a wide, pleated dress, and the outer skirt was replaced by a broad piece of linen fastened in front like an apron. Clothes were becoming richer and more elaborate all the time, and the Pharaoh's ceremonial dress of complicated design and dazzling colours embroidered with gold, with a gold diadem, was fitting for an earthly god (Figures 5 and 8).

Egyptian women, including the queen, wore a simple straight dress, tight-fitting and reaching to their ankles, which showed off their slender elegance (Figure 6). At first women of all classes wore homespun linen garments, sometimes embroidered, but in time weavers learned how to make exquisitely fine fabrics like lawn or muslin. Dresses were pleated from the time of the New Kingdom, and linen capes worn over them (Figure 7). Both men and women wore wigs and jewellery, gold collars and bracelets, anklets, earrings, rings, necklaces, and fillets of gold and semi-precious stones such as amethysts and brilliant blue lapis lazuli.

Early Egyptian houses

The earliest Egyptian houses were made of reeds plastered with mud from the river Nile. Later the Egyptians made bricks from the mud, which they dried in the sun, and they roofed their houses with reeds and palm branches.

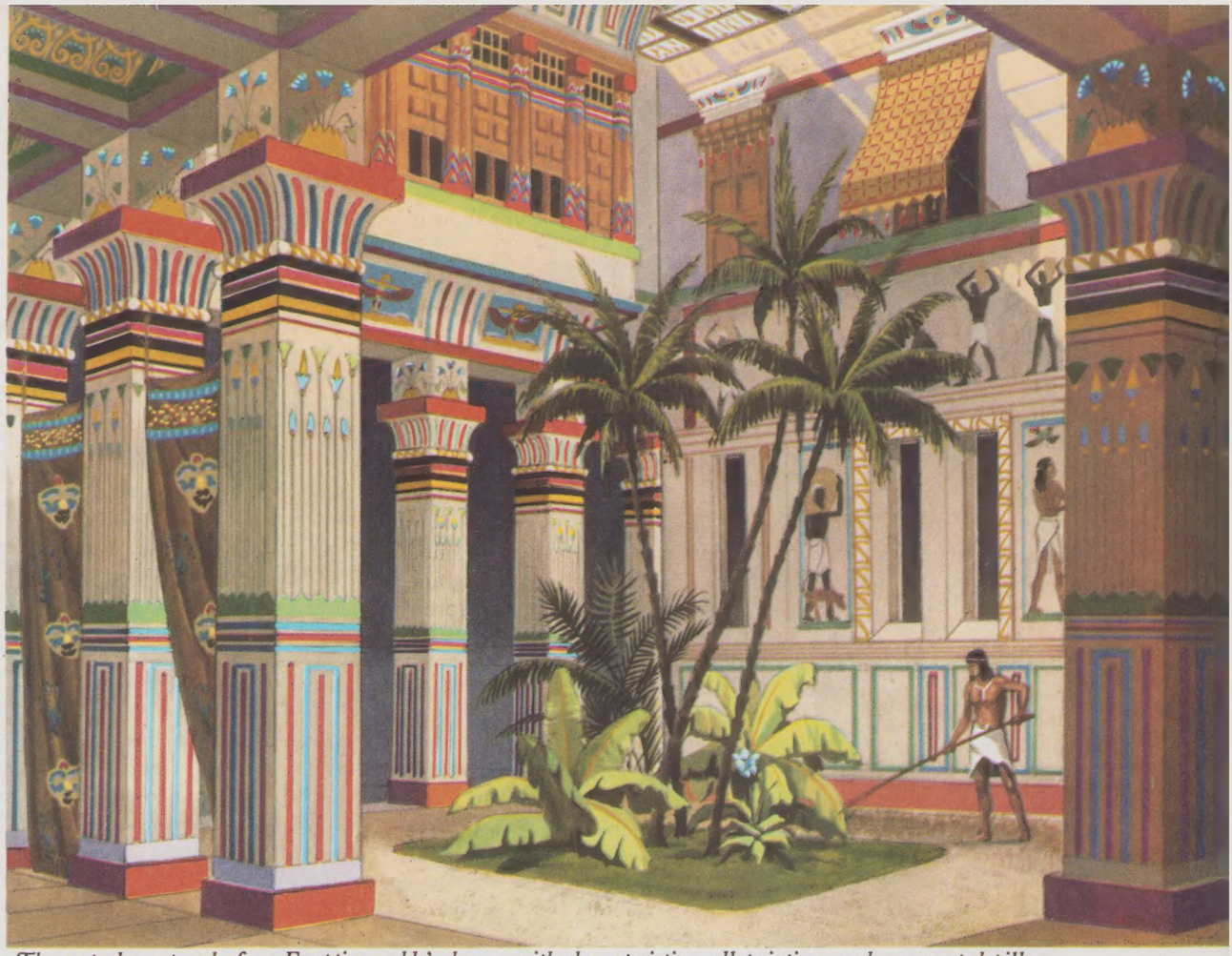
When they discovered how to use stone as a building material, they built temples in granite, limestone, and sandstone, and splendid pyramids and tombs for their kings. But the people, even the kings, went on living in mud-brick houses, brilliantly painted on the inside. Stone was used only for the bases of pillars, thresholds, and door-jambs, and wood for the pillars or columns, doorposts, and window frames. A good deal has been learned about these Ancient Egyptian houses from the pottery models of houses placed in the tombs, for the souls of the dead to live in, from wall-paintings in the tombs, and from a few dwellings preserved in a temple at Thebes. In these clay models the brickwork of the floors of upper rooms, the details of wooden columns, and even ventilators in the roof are all preserved, and furniture is there too – high-backed chairs, couches, stands for water-jars, and stone corn-grinders under the stairs.

Buildings of the Middle Kingdom

Our knowledge of the town houses of the Middle Kingdom (2150–1780 B C) comes from the excavation of a walled town, Kahun, built to provide homes for the officials and workmen who were constructing the Lahun Pyramid. The simplest houses had an open court opposite the entrance, a living-room on one side, and two store-rooms on the other, with a staircase up to the roof. Larger houses had open courtyards with several rooms opening off them; the bigger rooms had vaulted, brick ceilings, the smaller ones were roofed with poles and thatch, and all the doors, which were wooden, were arched. The fire was usually against one side of the room, with a few bricks as stands for cooking pots. The great mansions where important officials lived were more varied, but always had an enclosed garden, an open court or hall with columns around a central stone tank, another court with a closed roof, and blocks of buildings connected by passages, for the family, for receiving visitors, for kitchens and servants, and for store-rooms. The master of the house had his own apartments, and the women's quarters were separate from the rest of the house; these included the wife's living-room, bedroom, and bath. The whole house of 50 rooms or more had a single narrow entrance from the street. In the brilliant sunshine of Egypt, small windows, or indirect light from doors opening on to courtyards, gave enough light, and windows in upper storeys were closed by gratings. Rich people's houses had several storeys, and often had their granaries on

the roof, where in one corner was a light structure with curtains where the family might sit in the cool of the evening. At night the rooms were lit by shallow, stone or clay lamps containing vegetable oil, with linen wicks.

The picture we have of these town houses is completed by the wooden, painted models of houses found in tombs, and by some interiors of tombs. A model of the house of Meketra, Chancellor of King Se-ankh-Kara in the 11th Dynasty, was found in Thebes, the capital of the Middle Kingdom. It has gaily striped columns shaped like papyrus plants, supporting a flat roof with two projecting waterspouts. A rock tomb of the same period at Beni Hasan imitates a hall, with pillars ending in lotus-bud capitals. The Ancient Egyptians loved gardens and flowers. When a feast was held, the hall was lavishly decorated with flowers, and the guests were given bouquets and necklaces of lotus flowers. Courtyards were planted with vines, palms, and fruit trees, with ponds for fish and water plants.



The central courtyard of an Egyptian noble's house, with characteristic wall paintings and ornamented pillars

Palaces of the Pharaohs

Research into the period of the New Kingdom, beginning with the 18th Dynasty B C, has often revealed the actual buildings in which the royal family of Egypt lived. Excavation has recovered fascinating remains and clues to structure and decoration, and Egyptian artists of the time have helped by painting houses in all their detail on the walls of tombs. In Amenhotep III's palace at Thebes the plastered walls and ceilings were painted in glowing colours, with interweaving and spiral patterns, friezes and dados of dancing figures, bands of red and blue rosettes, bulls' heads, plants and flowers, flying pigeons and vultures, and wild animals in the desert. Floors were painted to look like pools bordered with plants, with birds flying over them.

Egyptian furniture

As early as the 1st Dynasty, 3000 B C, Egyptian craftsmen were making carved chairs, beds, and chests with bronze and copper fittings. Egyptian chairs had high, straight backs, and sometimes needed footstools and cushions for comfort, but low-backed armchairs were often used as well. Plaited rope, leather thongs, and papyrus cords were used for seats and mattresses. The table at which the family sat for meals was made of a round slab about 12 inches high. Clothes were kept in wooden chests and jewellery in inlaid coffers. Bedsteads were rectangular, the four legs carved like a lion's, and the frame was filled in with wood or cord matting, and covered with reed mats or cushions. A wooden headrest, curved to fit the head above the ears, was used instead of a pillow. The best furniture was made of rare and beautiful woods, inlaid with ivory or bone or shells, and overlaid with gold. Luckily some of the finest furniture the Egyptians ever made has been preserved for us in the famous tomb of King Tutankh-amen.

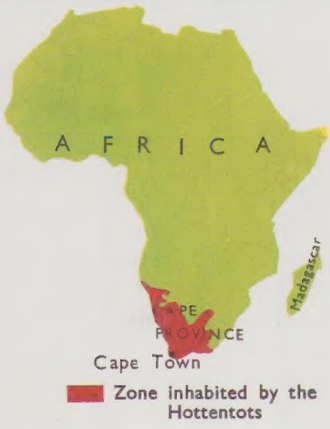
A small wooden model showing the entrance court of an Egyptian noble's house and the garden in front of it

Chest inlaid with gold and ivory

Wooden chair inlaid with ivory

Finely decorated terracotta vases

THE HOTTENTOTS



AN Englishman travelling in South Africa in 1775 wrote of a Hottentot tribe: 'They had a great quantity of cattle, and seemed to live very happily in their way. As soon as they had taken their cattle up from pasture they milked them, an occupation they intermixed with singing and dancing. We were received by them with a friendly simplicity and homely freedom. They presented us with milk, and danced at our request.' Another Englishman, writing some years earlier, describes the Hottentots as 'cheerful, dirty, hospitable, and incurably indolent' (lazy).

Conflict with the Boers

The Hottentots are thought to have migrated from East Africa, first to the Great Lakes and then, as the Bantu tribes advanced, to South-west Africa. When the Dutch settled at the Cape of Good Hope in 1652, they found Hottentots and Bushmen wandering freely over the hills and plains. The Bushmen were hunters (see page 1974), but the Hottentots were wandering shepherds, who kept flocks of long-legged, fat-tailed sheep, and herds of tough, hump-backed cattle which could endure drought, heat, and insect pests. The Hottentots were more intelligent and could be taught more easily than the Bushmen, and they suffered a worse fate. The Boer (Dutch) farmers and frontiersmen looked on the Bushmen as dangerous animals which carried off their cattle and deserved to be shot, but those who survived stayed free. Although the Hottentots also raided cattle from the Boers, they were on the whole friendly and willing to barter (exchange) food and cattle for tobacco, beads, copper wire, and brandy. So they were not destroyed, only dispossessed. The new settlers took their pasture-lands and cattle, and the Hottentots were made to serve them. They became herdsmen and servants of the Boers, separated from their clans, many of them overworked, ill-paid, and often beaten, with little hope of fair treatment, for they had no legal status. Hundreds of Hottentots died in the smallpox epidemic of 1713 in Cape Colony.

A Hottentot man

In 1806 the Colony passed from Dutch to British rule, and in the following year Britain abolished the slave trade. Since the supply of Negro and Malay slaves had come to an end, the colonists saw the Hottentots as a new source of cheap labour. English and Scottish missionaries were violently attacked by the colonists for encouraging the Hottentots to live in their institutions, where they were protected and taught, instead of having to work on farms and in Boer households. The Pass Ordinance of 1809, which pretended to be an attempt to make them settle in one place, in fact forced the Hottentots into the service of Europeans. They had to register for work in their districts, which they could not leave without a pass from the *landdrost* or local magistrate, who could punish them for minor offences without a trial. Another law in 1812 forced Hottentot children to become apprentices to their parents' employers. Hottentots, who had no money, nor the legal right to buy land, *had* to take service, however hard, or be imprisoned for vagrancy (that is, for wandering without employment). At last, in 1828, these harsh laws were abolished by the famous Ordinance 50, the result of untiring efforts by the missionaries and especially by Dr John Philip, who devoted his life to helping the Hottentots. This Ordinance gave Hottentots the same legal and civil rights as Europeans; they were allowed to choose whom they worked for, and were free to buy land. But it was now too late; no land remained for Hottentots to live on, and these landless people were absorbed into the mixture of peoples in Cape Colony. Many of their descendants are the 'Cape Coloured' people of today.

A Hottentot woman in a skin cloak

How the Hottentots live

Less than 24,000 pure-bred Hottentots survive. They live in European settlements or in official reserves. They are taller than Bushmen and have longer, narrower heads, light-brown skins, and rather flat faces, with slanting brown eyes and black 'peppercorn' hair growing in little tufts. They wear leather loincloths and aprons as their native dress, with copper and shell ornaments, and sheepskin cloaks or karosses in winter. But many of them now wear European clothes. They are 'displaced persons' with no real home and little hope for the future.

Hottentots living outside the towns still rely on their cattle, sheep, and goats for a living, but it is difficult for them to find pasture, and water is even scarcer than grass. They keep the animals for milk, and never kill them for meat except on special occasions like marriage feasts. They grow wheat, maize, millet, and beans in a casual way, and hunting is restricted by law.

Some of the Hottentots know how to smelt and work iron and copper. They make wooden bowls and plates, skin bags for carrying water and milk, and baskets and mats.

Their beehive huts are easy to set up, take down, and transport. They plant 20 or more upright pieces of wood in a circle three to five yards across. These poles are bent over and tied at the top to make a framework which is strengthened by intertwining sticks, and reed mats are tied to them to make a covering. In wet weather the reeds swell, making the mats waterproof. The huts are strong enough to resist storms, and in cold weather a lining of skins and a mat over the entrance make them warm. The fireplace is in the middle of the floor, and the family sleep round it on skins or rugs.

The Hottentots' 'beehive' huts are easy to put up. Note the water skins hung on nearby trees

LEONARDO DA VINCI AS AN ENGINEER (part one)

LEONARDO DA VINCI (see pages 353–355) was an accomplished painter, sculptor, musician, architect, and engineer. But for many years after his death, in 1519, his engineering genius was not fully appreciated. In fact, it was only in the 19th century that his true worth as an engineer began to be realised.

In 1481 Leonardo wrote a remarkable letter to Ludovico Sforza, the ruler of Milan, applying for employment and patronage. He knew that Ludovico wanted a sculptor to produce a statue in honour of his father, and therefore mentioned his own ability as a sculptor – but only briefly and in the final paragraph. The bulk of the letter was taken up in listing his engineering abilities, especially those concerned with the art of war. This was a clever move, because Leonardo knew that Ludovico Sforza was in political difficulties and threatened by enemies on all sides.

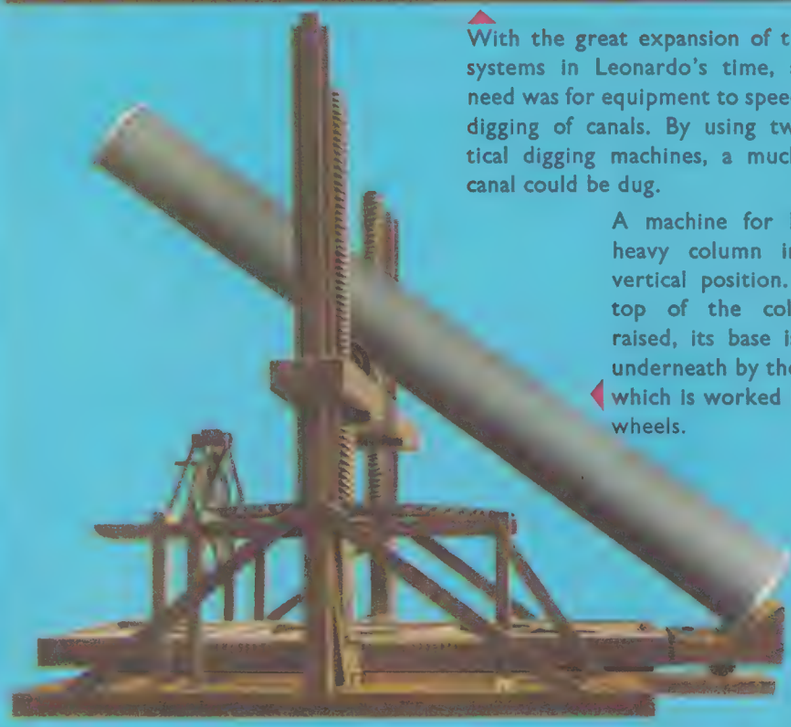
Leonardo wrote, in part: 'I have a process for the construction of light bridges, capable of easy transport . . . and others, more solid, which will resist both fire and sword and which are easily lowered. I know how to drain moats and construct scaling ladders. I have a means of destruction by mining providing the foundations of the fortress are not of rock. I know also how to make light cannon easy of transport, capable of ejecting inflammable matter. By means of narrow and tortuous subterranean tunnels I am able to create a passage to inaccessible places, even under rivers. I know how to construct secure and covered wagons for the transport of guns into the enemy's lines [this may have been a vision of the modern tank]. In short, I am able to devise endless means of attack. In times of peace, I believe that I can compete with anyone in architecture and in the construction of both public and private monuments and in the building of canals.'

This was an amazing letter for a young man of 29 to write, in the year 1481, but it secured him the job. It is all the more amazing in that every claim made in this letter was, at one time or another, substantiated by notes and sketches in his notebooks. The notes indicate a man of scientific genius, a man whose powers of analysis and investigation placed him hundreds of years ahead of his time.

CIVIL ENGINEERING

The 14th and 15th centuries were periods of great activity in the construction of canals in Europe, especially in France, Italy, and the Netherlands. Much of Leonardo da Vinci's civil engineering work was therefore concerned with the planning and construction of canals. But another reason for his particular interest in canals was his life-long fascination with the problems of water flow and the 'Nature of Water'. Indeed, it was his work on this subject which caught the attention of the Cardinal of Aragon's secretary, Antonio de Beatis, when he visited Leonardo at his manor house on the river Loire in France during the last years of the great man's life. Besides his work on canals, however, Leonardo was concerned with road building, town planning, bridge building, and the dredging of swamps and marshes. He also designed pumps and cranes of all types for use in these and other projects.

With the great expansion of the canal systems in Leonardo's time, a major need was for equipment to speed up the digging of canals. By using two identical digging machines, a much wider canal could be dug.

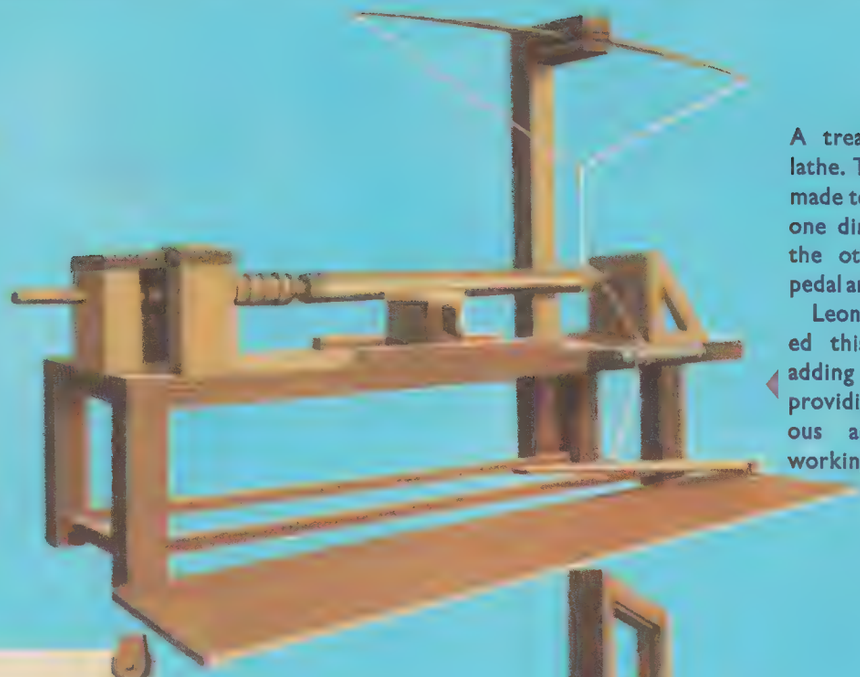


A machine for lifting a heavy column into the vertical position. As the top of the column is raised, its base is pulled underneath by the trolley which is worked by gear-wheels.

A simple device enabling the wheels of a cart to move at different speeds.

MECHANICAL ENGINEERING

Leonardo was not just a theorist but a practical engineer as well, and he sketched designs for equipment which would be needed in any machine-shop, even today. He devised machines for cutting, turning, filing, drilling, planing, polishing mirrors, sharpening needles, and many other purposes. Of course, he did not always invent totally new machines: many of his mechanisms were similar to ones already in use, but in nearly all cases he suggested improvements in their design. Many of his inventions were, however, products of his own fertile imagination; some were probably put into use, while others may have been too advanced for their period.

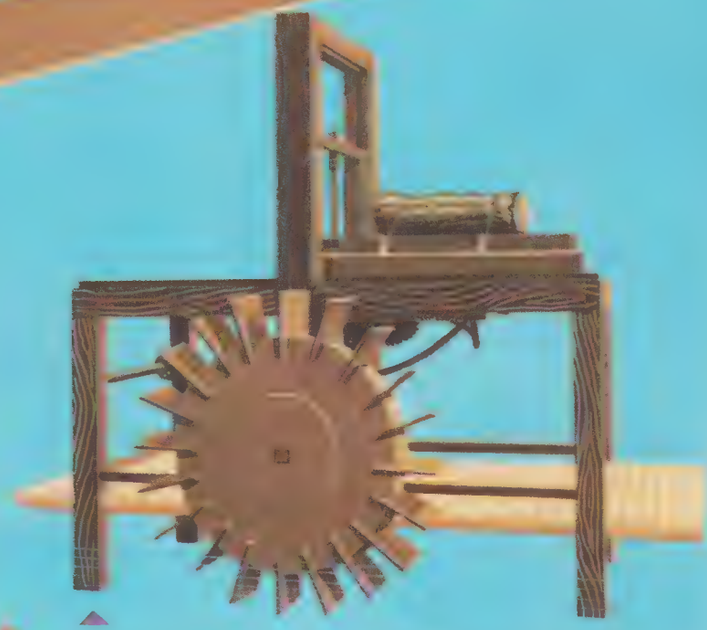


A treadle-operated lathe. The lathe was made to turn first in one direction, then the other, by the pedal and the spring.

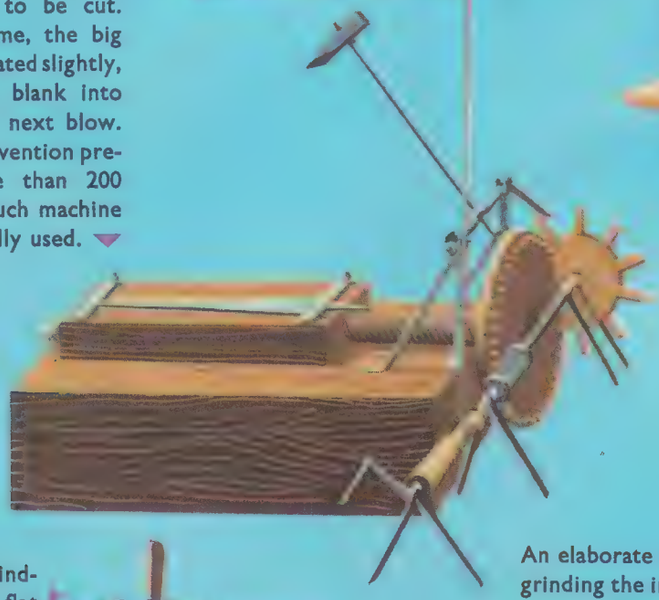
Leonardo improved this device by adding a flywheel providing continuous and uniform working.

How files used to be made in the time of Leonardo (from a contemporary illustration).

Leonardo's file-cutting machine. As the heavy weight falls, it forces the hammer down on to the file blank, causing a nick to be cut. At the same time, the big gear-wheel is rotated slightly, moving the file blank into position for the next blow. This ingenious invention predated by more than 200 years the first such machine which was actually used.



A fully automatic timber saw designed by Leonardo. It was powered by water which turned the big paddle wheel. This paddle was connected by a system of gears to both the log and the vertical saw blade; the log moved gradually along, while the blade moved up and down.



Machine for grinding a perfectly flat surface onto a metal mirror.

An elaborate mechanism for grinding the insides of tubes, such as cannon, to make them perfectly cylindrical. Leonardo's design was probably based on a machine of German origin.

He saw the need for some method of lubricating the moving parts while the machine was in operation. He also included in his design a vessel to collect the lubricant.

TEXTILE MACHINERY

Leonardo da Vinci designed many pieces of equipment for the textile manufacturing industry, then a lively business in Lombardy. But most of them were not fully understood by his contemporaries and did not appear in practical use until as much as 200 or 300 years later. For instance, his machine for distributing the thread over the bobbin as spinning proceeds (illustrated below) was the forerunner of Arkwright's famous spinning machine of 1775. When a device similar to Leonardo's 'cropping' machine was introduced in Nottingham 150 years later, the workers, thinking it would mean unemployment for them, smashed the equipment and burnt the factory. This machine wound thread on to a spool by revolving the spool and moving the guide back and forth.

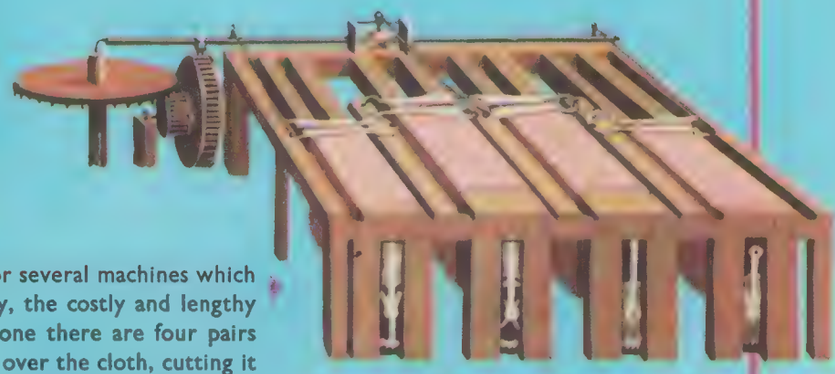
An invention with 15 spindles for twisting threads.

① Raising the 'nap' on a piece of cloth by brushing it laboriously by hand with small burrs.

② Drawing by Leonardo of a mechanical nap-raising machine.

③ This nap-raising machine, not very different from Leonardo's invention, was used until fairly recently.

After the nap has been raised on a piece of cloth, it has to be 'cropped'. This consists of cutting the nap down to a uniform level. In Leonardo's time, and for many years afterwards, this had to be done by hand.



Leonardo sketched designs for several machines which would perform, automatically, the costly and lengthy process of cropping. In this one there are four pairs of shears which move swiftly over the cloth, cutting it to an even length. It is hard to believe that these two methods of doing the same job date from the same period. That they do is a measure of Leonardo's genius.

CAVES

CAVES are a phenomenon of exceptional interest. They are often places of great beauty, and many of them have been opened up and lit by artificial means in order that visitors may see the natural wonders within. For some people, exploring caves is an absorbing hobby. Such exploration requires great skill and courage, and fatal accidents have been known to occur. Others study some particular aspect of caves, such as the flora and fauna that are found in them, or the remains of extinct animals that perished there long ago. Moreover, thousands of years ago man often lived in caves which formed good natural shelters, and much of our knowledge of prehistoric man comes from the material yielded by careful search among the debris on cave floors. The tools and remains of animals and fish, and the remarkable cave paintings which have been found in various parts of the world, tell us about his way of life. The study of caves in its various aspects is known as *speleology*.

How caves are formed

A cave can be described as an opening in a rock large enough for people to enter and move around in. Caves are formed in a number of ways – for example, through the action of the sea against cliffs. By far the most important way is the removal of material after a rock has been formed, especially in rocks of limestone. This type of rock is soluble in water, particularly if it contains carbon dioxide. As rain falls, it collects some carbon dioxide from the air, and as it soaks through the ground it picks up more carbon dioxide from decaying organic matter in the soil. The water which reaches the mass of limestone is often heavily charged with carbon dioxide, which rapidly dissolves the rock. Solution enlarges small crevices until they become passages, which may develop into great caverns. Sometimes rivers leave the surface of the land and flow through such channels for miles. Most limestone caves have deposits of calcium carbonate within them, which often cover the walls. The dripping of water from the roof sometimes results in hanging formations known as *stalactites*; those built up by water dripping on the floor are called *stalagmites*. They are caused by the slow evaporation of the dripping solution, heavily charged with calcium carbonate, which leaves a deposit behind. Much of the beauty of the caves is the result of these formations which frequently have fantastic shapes.

A cave beetle

Cave flora and fauna

Although there is no sunlight in underground caves, they are not lifeless; but because light is more important to plants than to animals, the flora is less varied than the fauna. Near the cave entrance, and by any electric-light bulbs that have been installed, some mosses and ferns are to be found. Otherwise fungi and bacteria are the most common forms of plant life in caves.

The abundant fauna includes mammals, fishes, and insects, as well as some more lowly forms of life. The large mammals which at one time used to inhabit caves are now extinct. The great cave bear, an enemy of early man, was 10 feet long and stood 5 feet at the shoulder. Cave mammals are now small, such as the bat, which inhabits caves the world over, either permanently or during hibernation. Fish are found in the underground waters of Mammoth Onyx Cave, Kentucky, and an amphibian, the proteus, inhabits the dark waters of caves in Carinthia and Dalmatia. There are many shrimps, beetles, and water fleas. Almost all are specially adapted to live in dark conditions. They are usually white or transparent and blind, but have developed exceptionally sensitive antennae or feelers.

The extinct great cave bear

ITALY

Caves are to be found in most parts of Italy. The largest is the Grotto of the Sea Ox, in Sardinia, of which more than 2½ miles of galleries and passages have already been explored.

The Castellana Caves near Murge, in the province of Bari, are the most interesting in Italy. There is a particularly large number of stalactites and stalagmites. These are beautiful and also highly colourful. White, black, and red are the chief colours.

Near Ventimiglia is the Caviglione Cave, which is noted for its red colouring and the remains of prehistoric men and animals.

BRITAIN

Caves in Britain are found chiefly in the Mendips, the Peak District of Derbyshire, parts of northern Yorkshire, and the Gower peninsula in South Wales.

Sea erosion has formed magnificent caverns such as Fingals' Cave in the Inner Hebrides (see page 1659). This is lined with gigantic pillars of rock, similar to the Giant's Causeway in County Antrim, Ireland. In some windy conditions the cave gives out a loud trumpeting sound which inspired Mendelssohn's famous 'Fingal's Cave' Overture. Another 'musical' cave, in Yorkshire, has eight stalactites which, when gently struck, sound like a peal of eight bells.

Excavation of Kent's Cavern in Torquay has provided archaeologists with valuable facts about the men who lived there during the Stone Age, and about the animals of that time. The Cheddar Gorge in the Mendips was probably formed by the collapse of the roof of a vast cave.

Stalactites (above) and stalagmites (below)

The entrance to the Sea Ox Caves in Sardinia

The entrance to the Caviglione Cave on the Ligurian coast

THE UNITED STATES

One of the biggest caves in the world is in the Carlsbad Caverns National Monument in New Mexico. The discovery was made in 1901, when a vast cloud of bats was seen leaving a crevice in the rocks. Now lifts take people down to the caves, where there is even a restaurant. Some 30 miles of galleries have already been explored, and yet there remain caves which are still inaccessible. The Big Room is about $1\frac{1}{4}$ miles long and $1\frac{1}{4}$ miles wide, and is reckoned to be more than 20 times as large as any other known cave. One of the stalagmites, nearly 70 feet tall, with a circumference of 16 feet, looks like a great lighthouse. The caves as a whole are famous for the varied colouring of the exotic formations. The many minerals with which the rocks are impregnated have resulted in pink, green, purple, yellow, and brown stalactites. Another giant American cave is the Mammoth Onyx Cave in Kentucky. Galleries already known extend for more than $2\frac{1}{2}$ miles from the entrance, and more remain to be explored. Two features are spectacular: a gigantic onyx formation in the form of a frozen waterfall, and a cave lined with gypsum crystals. These often resemble flowers, like daisies or even exotic lilies, with great outstretched petals. There are also rods of crystals which are from 4 to 8 inches long, projecting from the walls.

FRANCE

Some caves are more interesting for the paintings on their walls, which may be 20,000 years old, than for the beauty of their natural formations. An example is the vast Trois Frères Cave, near St Girons in the Pyrenees. Prehistoric men drew pictures on the walls of the animals they hunted: reindeer, bison, bears, lions, and tigers, and the weapons with which they killed them, their arrows and clubs. There is also a figure of a man painted in red and black, which is probably a representation of a prehistoric witch doctor. About 30 clay models of animals, including one of a bear standing about 3 feet high, have been discovered in the Montespan Caves, also in the Pyrenees.

SWITZERLAND

There are many caves in Switzerland, but few of any size. One of the more outstanding, the Höll-Loch (Hell-Hole), is in the Canton of Schwyz. It is both extensive and beautiful, and is noted for its stalactites and stalagmites.

A view of the Höll-Loch Cave in Switzerland

YUGOSLAVIA

The Postojna Caves in Yugoslavia are of great beauty, and are often visited by tourists. One cave even has a post office, from which many cards are sent describing the marvels of this underground fairyland. The most striking feature is the great number of stalactites and stalagmites which have assumed fantastic shapes. The formations are often coloured yellow or red, or even a deep purple. In the cave known as Milan Cathedral there is a 50-foot stalagmite, the tallest in the Postojna Caves; another looks very like a palm tree.

HOW WOUNDS HEAL

SOONER or later we all have the misfortune to cut ourselves. Usually it is a knife which does the damage, though sometimes quite unexpected things like a blade of grass, or even the edge of a sheet of paper, can produce a nasty cut. If the cut is small it bleeds for a little while, grows a scab on the top, and in the course of a few weeks heals so completely that all that remains is a little scar.

It is important that the skin should heal well like this. As you know, it is a sort of natural 'coat', covering the soft tissues of the body which lie underneath. When the skin is damaged precious body fluids escape from the soft tissues, while at the same time dangerous germs from outside can find their way into the tissues and cause infection.

Most of the cuts that we get are quite small ones. The two sides of the cut separate only a little, and healing takes place quickly and naturally. Sometimes, however, we may have a cut which is unpleasantly large. In such cases the two sides spread apart, and it is quite obvious that they cannot join together at all easily.

In cases like this, of course, we go to a doctor. By stitching the two sides of the cut together the wound can be made much smaller, and so it will heal much more quickly.

Although the idea of having one's skin sewn is rather horrid, it is, in fact, nothing like as unpleasant as it sounds. The skin near a cut can often be numbed with a *local anaesthetic*, and the stitches put in quite painlessly. Besides healing more quickly, a well-sewn wound is less likely to turn septic.

TREATMENT OF CUTS

A small cut needs only the simplest treatment. It should be allowed to bleed for a minute or two so that any dirt or germs carried in with the knife may be washed out. Clean the skin around with a little warm, soapy water, and then cover the cut with a small piece of lint and a bandage. If these are not available a clean handkerchief is just as good.

A CUT HEALS

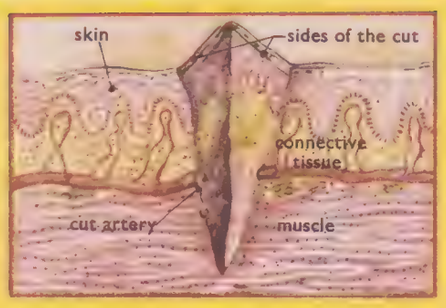
Here is a diagram of a cut as it appears at the time the accident happens. The knife has sliced through the skin and has even gone a little way into the muscle underneath. Notice how the sides of the wound part, and how the knife has severed a small artery. Notice, too, how clean the wound is. Cuts made with knives almost always have smooth, straight edges and are free from dirt.

Almost immediately, blood begins to escape from the severed artery. It fills the space in the wound and then begins to run out on to the surface of the skin. We say that the cut is bleeding. Then, after quite a short time, the blood in the wound solidifies into a *clot*. This clot blocks the cut ends of the artery and fills the space between the two sides of the wound, thus stopping the bleeding. At the same time it glues the sides of the wound firmly together.

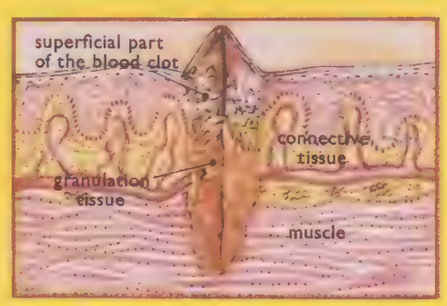
Within 24 hours of the injury the blood vessels on each side of the wound begin to develop many tiny branches. These new blood vessels grow rapidly in length, pushing their way into the blood clot that fills the wound. Within a few days the whole clot is a network of tiny new blood vessels. In among the network millions of long thin cells, called *fibroblasts*, appear. Their function is to keep the two sides of the wound together.

The mixture of blood vessels and fibroblasts is called *granulation tissue*. On its surface the cut edges of the skin grow across the top of the wound until they meet in the middle, and once more the skin is continuous.

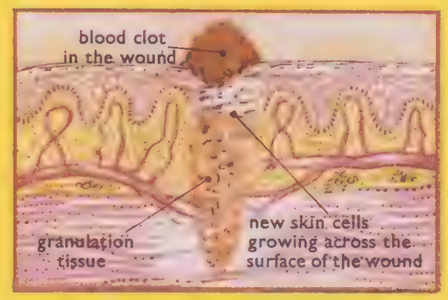
While this is happening the granulation tissue is slowly replaced with strong fibrous tissue. When the scab falls off, this *scar tissue* can be seen as a purple streak, but over some weeks, or even months, it gradually changes to white. This is the scar, which in many cases marks the site of the wound for ever.



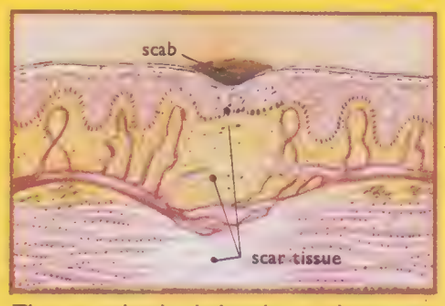
A diagram of the cut skin at the moment the wound is made



The wound is filled with clotted blood



Now the blood clot has been largely replaced with granulation tissue



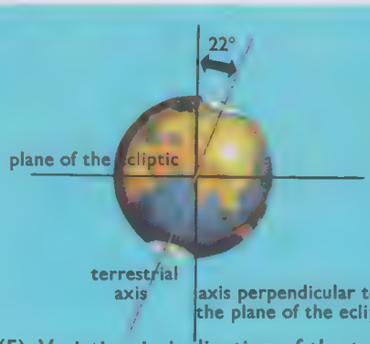
The wound is healed and new skin now covers the surface

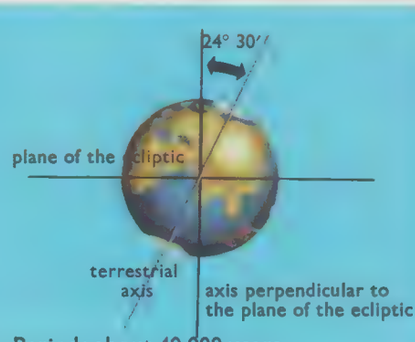
SCAR TISSUE. Scar tissue, although very strong, does not have the elasticity and flexibility that skin does. That is why skin that is badly scarred stretches much less easily than normal skin. Sometimes this is a serious handicap. A badly scarred finger, for example, may be so stiff that it is of little use. Vigorous exercises in hot, soapy water, however, can often soften scars and in this way return movement to stiffened parts.

THE MOVEMENT OF THE EARTH (part four)

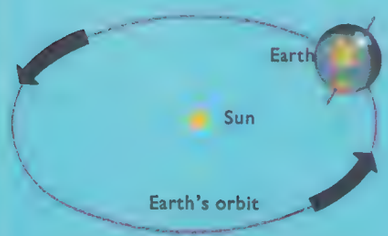
HERE is a summary of the various movements of the Earth, for in the three previous articles we have only described the three most important movements. The other movements are either very small or they occur very slowly. However, they may produce effects which we can see on the Earth itself. Certain of these slow changes have been used to explain, for example, the reason for ice ages and other changes in climate which have occurred during the long geological history of the Earth, although these astronomical changes may not be the only factor governing changes in climate.

(1) Rotation about own axis. Period: 23 h. 56 m. 4·095 s.

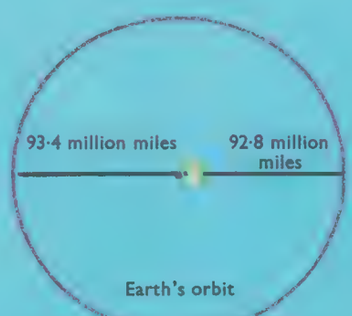


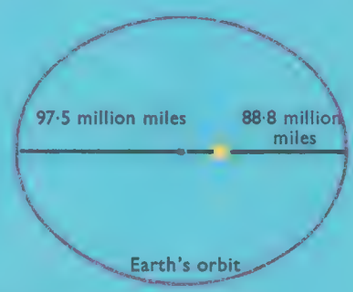


(5) Variation in inclination of the terrestrial axis. Period: about 40,000 years

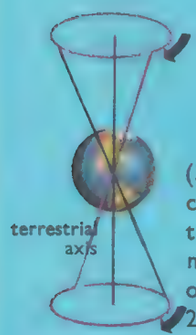


(2) Orbital revolution about the Sun. Period: 365·256 mean solar days

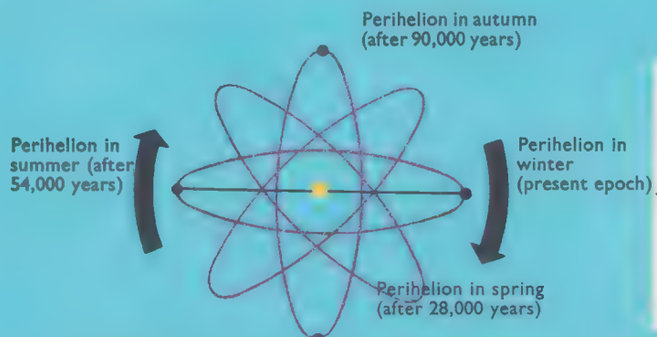




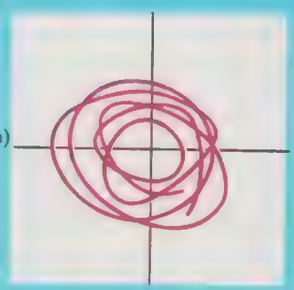
(6) Variation in the eccentricity of the Earth's orbit (the red spot indicates the intersection of the axes of the ellipse). Period: about 92,000 years



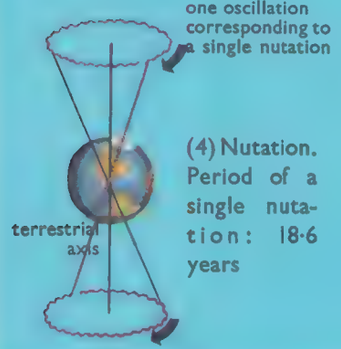
(3) The Precession of the Equinoxes. Period: about 25,800 years


Perihelion in autumn (after 90,000 years)
Perihelion in summer (after 54,000 years)
Perihelion in winter (present epoch)
Perihelion in spring (after 28,000 years)

(7) Rotation of the major axis of the orbit about the Sun. Period: about 110,000 years



(8) Minor fluctuations in the position of the geographical poles. The red line shows the perturbations in position of the North Pole which occur within a square of sides of 20 metres



(4) Nutation. Period of a single nutation: 18·6 years

(9) Monthly movement of the Earth towards the centre of gravity of the Earth-Sun couple
(10) Perturbations caused by the gravitational pull of the other planets
(11) Fluctuations in the position of the centre of gravity of the solar system
(12) The general movement of the entire solar system (at about 20 km/second relative to the fixed stars) towards a point within the constellation of Hercules (see page 1299)

CRANMER, LATIMER, and RIDLEY

Latimer preaching at Old St Paul's. His sermons stirred the common people throughout the land

SOME reformation of the English Church in the 16th century was bound to take place, but it happened when it did, and how it did, because King Henry VIII wanted a divorce from his wife, Catherine of Aragon.

Catherine had borne Henry one daughter, Mary, but since her birth no child had come. The Wars of the Roses were not far behind (see page 1868), and Henry felt that if he had no male heir there might well be civil war after his death.

Catherine had first married Henry's elder brother, Arthur; but Arthur died before he was able to come to the throne, and it was quickly arranged that the widowed Catherine should be married to Henry. But such a marriage, to a deceased brother's widow, was against the law of the Church, and special permission had to be obtained from the Pope before it could take place. As the years went by and no son was born to Catherine, Henry began to persuade himself that this was a sign of God's displeasure at a marriage which should never have happened. And, in addition, he had fallen in love with Anne Boleyn.

So Henry asked the Pope to declare that permission for him to marry Catherine had been wrongly given. If the Pope were to do this it would mean that Henry was not married to Catherine at all and that he was therefore quite free to marry Anne.

The rise of Thomas Cranmer

If Henry VIII had not wanted his divorce it is probable that Thomas Cranmer would have lived and died an obscure fellow of a Cambridge college. Chance brought him to power – and so to death by fire. He was born in Nottinghamshire in 1489 and went to Cambridge at the age of 14. At the age of 21 he became a fellow of Jesus College.

In 1529 a disease called the 'sweating sickness' struck Cambridge, and Cranmer was asked by two of his pupils to go and stay at their father's house in Essex. And it was there that the chance which was to change Cranmer's life occurred. Two of Henry's chief ministers happened to be staying in the house, and they fell into conversation with Cranmer about the matter of the King's divorce, which was not going at all well. Pope Clement VII was not co-operating – partly because he was afraid of Catherine's nephew, the Emperor Charles V. Wolsey's efforts to persuade the Pope had failed, and Wolsey had fallen from power in disgrace.

Cranmer, without any thought that he might become involved in the business, suggested that if the Pope would not change his mind the universities of Europe should be persuaded to declare that a marriage with a deceased brother's wife was *always* illegal, and that whatever a previous Pope may have said, Henry could not be married to Catherine.

Cranmer the Archbishop

Henry was delighted. He determined to speak to Cranmer himself. After a brief interview Cranmer found himself commanded to leave all other work and concentrate on the divorce. Three years later, when the Archbishop of Canterbury died, Cranmer was appointed in his place. And one year after that Henry, with the full approval of his new Archbishop, had broken all his ties with the Pope and had got the English Parliament to declare that the Pope had never had any power in England at all and that the supreme head of the English Church was the King himself.

So England broke with Rome, only thirteen years after Martin Luther (see page 1248) had stood alone before the Pope and the Holy Roman Emperor at Worms and roused all Germany with his revolt. England seemed ripe for just such a change in the form and doctrine of the Church as the Reformers were bringing about on the continent of Europe. But Henry was no extreme Protestant. The English Church might be free of the Pope, but so long as Henry was alive it would be Catholic in doctrine – and in his Act of Six Articles in 1539 Henry threatened unpleasant punishment to anyone who thought otherwise.

Henry died in 1547, and left his throne by will to the son his third wife had borne him, Edward VI. It was in the reign of this youthful king that the big changes in the doctrines of the English Church began; and Cranmer was at the centre of the changes. His greatest work was the production of two English Prayer Books, which replaced the old Roman Catholic service books.

Cranmer was a master of English prose. The Prayer Book used in the Church of England now still contains many of the beautiful prayers he wrote. Some were translations of ancient Latin prayers; but much of the book is Cranmer's original work. Look, for example, at the Litany –

which Cranmer wrote separately before Henry VIII died. Like much of the Prayer Book, the language may seem heavy and old-fashioned, but it has a wonderful, stately beauty.

The first of Cranmer's Prayer Books was issued in 1549, the second in 1552. The first was still very similar to the Roman Catholic service books. The second, showing the increasing Protestantism of the English Church, was more original, and the Church of England Prayer Book today is very similar to it.

Edward VI was never in good health, and he died in 1553. According to Henry's will he was to be succeeded by Catherine's daughter Mary, who was a Catholic, and Cranmer knew well enough that her succession would be his ruin. He could have fled the country, but he preferred to stay, to face whatever lay in store.

The martyrdom of Cranmer

Mary Tudor was a dour, disappointed woman, who had lived through her mother's humiliation. She was not the monster she has often been painted, and was not naturally cruel. But she was determined to restore in full the faith of her fathers. Like most people in the 16th century, she believed that people whose beliefs were erroneous were bound to receive everlasting punishment. At all costs she must save her people from such a fate, even if it meant cruel punishment for some on earth.

She could hardly fail to punish Cranmer, who had first suggested to her father a way of securing the divorce and who with his fellow bishops – Latimer, Ridley, and others – had, so she thought, misled the people of England. Under the influence of her husband, Philip of Spain, she made Parliament re-enact the old laws against heresy. Cranmer was arrested,

Thomas Cranmer, Archbishop of Canterbury

accused of heresy, and sentenced to death by burning.

Cranmer publicly renounced his Protestant beliefs. It is easy, so long after the event, to accuse him of cowardice. But he also believed that it was a grievous sin to disobey his lawful sovereign, so the accession of Mary placed him in a fearful dilemma. After a mental agony one can scarcely imagine, he went back on his denial. On 21st March 1556 he died bravely at the stake in Oxford, stretching out his hand to the flames first, it is said, so that all should see how worthless and shameful was the hand which had signed his recantation.

Latimer

Hugh Latimer, who was born in 1490, died five months before Cranmer. He was one of the greatest preachers of the Church of England, and his sermons were immensely powerful and simple. He was not an academic man like Cranmer, but he was better known by the common people, and his sermons preached in London at St Paul's were famous throughout the land. He was arrested soon after the accession of Mary and condemned to be burned. He was burned at Oxford with Ridley in 1555. As he was led to the stake he cried out to Ridley: 'Be of good comfort, Master Ridley, and play the man; we shall this day light such a candle by God's grace in England as (I trust) shall never be put out.'

Ridley

Nicholas Ridley was born in Northumberland in 1500, and like Cranmer he went to Cambridge. Later, he studied on the continent of Europe, and in 1537 he became chaplain to Cranmer. Throughout the rest of his life he was closely associated with Cranmer, and he helped him in the writing of both the Prayer Books of the reign of Edward VI. He delivered his most famous sermon in London just after the death of Edward VI, when he declared that the true queen of England was Lady Jane Grey and that both Mary and Elizabeth were illegitimate.

After this he could expect little mercy from the triumphant Mary, even though he pleaded to be pardoned from the charge of high treason. He was sent to the Tower, and he later joined Cranmer and Latimer in Oxford on trial for heresy. He died on the same day as Latimer.

The aftermath

It took the English many centuries to forgive the Roman Catholics for what Mary's government had done. They forgot what the Protestant governments had sometimes done to Catholics. We live in an age when men are no longer burned alive for what they believe, but we cannot forget that the martyrs of 16th-century England were men of courage and heroism.

Latimer and Ridley were burnt at the stake on the same day

PLATO: the great philosopher

PLATO was born in 427 B C. He came of a distinguished Athenian family, many of whose members were prominent in public life, and he had every reason to look forward himself to a career in politics. But early in life he became a devoted disciple of Socrates (see page 817), and when Socrates was put to death by the restored Athenian democracy in 399, Plato's disgust became so intense that he decided to devote himself to philosophy and to take no part in public affairs. He believed, as he tells us in one of his letters, that there was no hope of improvement in human society unless philosophers gained political power, or men with political power became philosophers.

Most of Plato's writings are in the form of dialogues (conversations in which philosophical subjects are discussed), and in many of them Socrates is the principal speaker. The earlier dialogues are devoted to defending the memory of Socrates and provide examples of the method of conversation which Socrates actually used, but as time went on Plato developed his own philosophy, which went far beyond that of Socrates, and it is generally accepted that the views which he places in Socrates's mouth in the great dialogues, such as *Phaedo*, *Republic*, *Symposium*, and *Phaedrus*, are those of Plato himself rather than of Socrates.

Although we are dependent on his dialogues for our knowledge of Plato's thought, Plato himself believed that his activity as a teacher was more important and profound in its effect than anything he wrote. In 386, after a period of travel in the course of which he certainly visited Sicily, he founded the famous philosophical school at Athens known as the Academy, which remained in existence for many hundred years, though it was not always true to its founder's teaching.

Plato, one of the greatest Greek philosophers

THE THEORY OF IDEAS

The object of the Academy under Plato was to produce philosopher-statesmen by discovering the knowledge that Socrates had said was virtue, but in pursuit of this knowledge Plato developed an elaborate theory about the nature of reality which at first sight has little to do with politics. This theory is known as the Theory of Ideas or Forms; Plato came to believe that only something which does not change in any way, and which has a permanent existence, can be said to be real and knowable. Such things, he said, do not exist in our world where all things change and only exist for a certain period of time. But outside time and space, said Plato, there exists a world of perfect Forms, of which things in our world are only imperfect and half-real copies. The soul exists in this world of Forms before birth, and the philosopher's business is to recapture his lost knowledge of it and then to apply it in the conduct of human affairs. For this a long and arduous training is necessary, in which mathematics play an important part. There is a story that Plato had inscribed on the doors of the Academy the words 'Let no one enter who is unacquainted with geometry', and many of his successors in the Academy were primarily mathematicians.

The Theory of Ideas is one of the most important philosophical theories ever produced, and its influence upon the whole subsequent history of philosophy has been immense. The fullest account of it, and of the training of the philosopher, together with a description of the ideal state in which he is to rule, is to be found in the *Republic*, a dialogue of Plato's middle period, which is one of the very great books of the world, and which has often been translated into English.

Plato was not only a philosopher, but a great literary artist with a perfect style and a strong vein of poetry and humour. These add great charm to many of his dialogues, though in his later works, which are increasingly difficult and abstract, everything else is subordinated to the single-minded pursuit of truth.

Once in his life, in 367, Plato had an opportunity of putting his ideas into practice. He was invited by Dion, the chief minister of Syracuse, whose friend he had become during his first visit to Sicily, to come over to Sicily again to train Dion's nephew, Dionysius II, as a philosopher-ruler. But Dionysius, who was already 28, was too old to take kindly to the abstract studies which were an indispensable part of Plato's programme, and the attempt ended in failure.

Plato returned to Athens, and in his old age produced a treatise known as the *Laws*, which contains the nearest approach to his ideal state which he thought had any chance whatever of being put into practice. He died in 347.

PLATONIST OR ARISTOTELIAN

In no way did the genius of the Ancient Greeks shine more brightly than in the fields of philosophy and mathematics, and what is remarkable is that two of the most outstanding and influential philosophers in the entire history of human thought, Plato and Aristotle, lived in Greece within 50 years of each other.

Samuel Coleridge, the 19th-century English essayist, once wrote that each of us from birth is either a Platonist or an Aristotelian, and there is much truth in this puzzling statement. Plato had a deep moral earnestness and lofty idealism, and an unshakable belief in the beautiful and the good, whereas Aristotle was more concerned with observation of the common man and of the world we live in, his thinking characterised by coolness and inspired common sense.

The division represented by these two brilliant men has endured in human thought through the ages.

FOCUS ON ETHIOPIA

The Lion of Judah – a monarch who seems rather out of place in the 20th century.

Barren, poor, backward, and mountainous, Ethiopia could be the scene of great changes after the Emperor's death.

ETHIOPIA is one of the most extraordinary countries in Africa: an ancient empire whose Emperor bitterly attacks imperialists; an ancient civilisation with large numbers of the people illiterate and desperately poor.

The Ethiopians look upon themselves as one of the most forward nations in Africa, although their regime is autocratic and economically backward.

Ethiopians can boast of the two magnificent Boeings owned by Ethiopian Airlines, but most of the people travel in the same way as their ancestors of 1,000 years ago.

Addis Ababa, the capital, has many fine buildings; the outskirts, however, are marred by depressing shanty towns. The Soviet Union takes a great interest in Ethiopia, and has a large and well-equipped embassy at Addis Ababa, but Ethiopia shows little sign, as yet, of turning towards Communism.

Dominating Ethiopia is the sad-looking but dynamic and astute Emperor Haile Selassie, one of whose titles is 'Lion of Judah'. He has been an effective ruler of Ethiopia since 1916.

Two years ago, when he was out of the country, there was an attempt to overthrow his government. The Lion returned and quashed the rebellion with speed and ruthlessness.

The attempted coup showed two things: first, that it is the strong and personal rule of the Emperor that keeps the state united; and secondly, that there is a certain amount of dissatisfaction with his rule.

When the magnificent Emperor dies there may be great upheavals in Ethiopia.

A mediaeval fresco painting of St George and the Dragon – from the earliest times the dominant religious beliefs in Ethiopia have been those of the (Christian) Coptic Church.

A group of Ethiopians in the centre of a village – in some places life has changed little in the last 1,000 years.

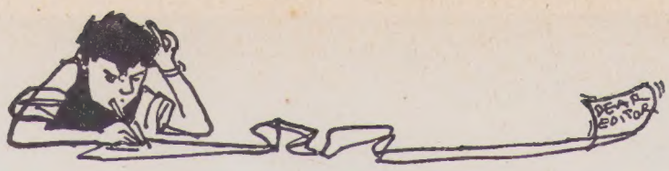
The Mad Emperor

One of the most extraordinary of Ethiopia's many extraordinary rulers was the mad Emperor Theodore. He was a curious mixture: on the one hand delighting in plunder, massacre, wine and women; on the other, very intelligent. He had the misfortune to imprison the British Consul in Ethiopia. In 1867 retribution for this crime came his way. A large force under Lieutenant-General Napier advanced on his great fortress of Magdala. Theodore was routed in his first encounter with Napier's troops. He then tried, unsuccessfully, to commit suicide. After this he sent 1,000 cows and 800 sheep to Napier as a peace offering, but the British commander attacked again. This time Theodore was successful in committing suicide.

Over 4,000,000 Stetsons are now sold in the USA every year. But this popular cowboy hat only came into being because a poor factory worker fell ill. John Stetson was born in New Jersey in 1830. He worked in a Philadelphia hat factory until he developed a serious chest complaint, for which the only cure was apparently an open-air life. So John Stetson joined a band of penniless young adventurers and started the long journey out West. One day in camp he was asked to show his companions how felt was made. This he did, and, in order to protect his face from the sun, he made his piece of felt into a large, wide-brimmed hat. The party soon encountered a group of cowboys, one of whom admired Stetson's hat so much that he offered to buy it. Soon there was a rush for Stetson's hats, and he started to make them as a full-time job. When he died, in 1906, he left a vast fortune.

How did the chequered flag, which greets the winner in a motor race, originate? At a race meeting in France someone suggested that a signal should be given to the winner, but no flag could be found at the track. One of the drivers quickly whipped off his shirt, fashionably checked in black and white, and this pattern has been used ever since.

You write – thousands read!



Campaign Supporters

DEAR EDITOR—Our form at school felt very strongly about the Freedom from Hunger Campaign and so we had a form effort lasting for one week. We sold cold drinks, cakes, biscuits and packets of crisps donated by the girls. One girl's mother kindly donated a beautiful cake for a 'Guess the Weight Competition'. By the end of the week, with the help of the rest of the school, we had raised over £15, which was sent to the Oxford Committee for Famine Relief.

Hinda Prizant,
104 Kings Road,
Prestwich, Lancs.

Congratulations on a fine effort for a good cause. I know that many of our readers have given their support to the Freedom from Hunger Campaign.—Editor.

Water Cure

Patient: What is the best cure for water on the knee?
Doctor: Drainpipe trousers.

David Shonfield (age 12),
21 Paultons Square,
London, S.W.3.

Tiny Pet

DEAR EDITOR—I am fortunate in having a very small Chihuahua dog which I call Petra.

These dogs have an interesting history.

Originally they came from a province in Mexico called Chihuahua. They lived in burrows under the earth and were quite rare. Then they became popular as pets and were introduced into this country in recent years.

Janet Wood (age 12),
50 Malvern Road,
Scunthorpe, Lincs.

It is also known that the Aztecs, ancient inhabitants of Mexico, worshipped the Chihuahua.—Editor.

Time Theory

DEAR EDITOR—No one can possibly fully understand the meaning of 'time', but Dr H. W. Van Loon has attempted to explain it in the following graphic manner:

'High up in the north there stands a rock. It is 100 miles high, 100 miles long, and 100 miles wide. Once every thousand years a little bird comes to this rock to sharpen its beak. When the rock has been worn away by the bird, then a single day of eternity will have gone by.'

The mind reels at such a picture of eternity, especially when we remember that man's occupation of the earth is probably only about 500,000 years, and that the known history of Great Britain is little more than 2,000 years.

Frances Wood,
49 Tennyson Road,
Daventry, Northants.

School Play

DEAR EDITOR—In *Knowledge* No. 81 there was an article on Joan of Arc, in which you mentioned the play *St Joan* by George Bernard Shaw. Our school play this year was *St Joan* and we gave three performances. Although I was not in the play, I enjoyed it so much that I went to see it twice.

Miriam Tuckwell,
273 White Horse Lane,
South Norwood,
London, S.E.25.

The Rock

DEAR EDITOR—In your article about Gibraltar (*Knowledge* No. 117) there is what could be regarded as a contradiction. First you state, correctly, that Gibraltar is an isthmus, being joined to Spain by a narrow strip of land. Then you refer to the water problems of the 'island'.

When Columbus sailed to the New World in 1492, he left the Costa Brava (the eastern coast of Spain) and sailed between Gibraltar and the continent through a narrow channel separating the rock from Spain. Thus, in 1492 Gibraltar *was* an island.

Throughout the years the sea has been piling up mud and sand until the channel has become choked and the present-day isthmus was formed.

John Santos,
80 Alameda House,
Red Sands Road,
Gibraltar.

To Fit the Crime

DEAR EDITOR—I have read that, in a certain part of America, motorists who have broken the law are suitably punished. The judge makes them attend the funeral of someone killed in a road accident, or makes them visit a hospital where car-crash victims are cared for. Then the offenders have to write about what they have seen, and most of them drive more safely after that.

The worst offenders, convicted of dangerous driving, are shown a film of two careless drivers, travelling towards each other on a winding road. They do not slow down to turn a corner, and crash. The results of the accident are so horrifying to witness that it has a profound effect on those watching.

Many people are against this sort of punishment, but those who are subjected to it say that it taught them a good lesson. It is a better system than fines, because car-owners must have money (to pay for petrol, insurance, and so on) and a small fine will not prevent them from driving dangerously again.

Zofia Krajewska (age 12),
32 Rugwood Road,
Flackwell Heath,
High Wycombe,
Buckinghamshire.

Life in Lahore

DEAR EDITOR—Lahore is an old provincial capital and has many modern industries and important railway workshops. It is also famous for its historical buildings and monuments. Two of these are the Shalimar Gardens and the Bahd Shahi Mosque. Another which is no less famous is Jehangir's Tomb.

Lahore is a beautiful city with wide roads and fresh green trees. Flowers and fruit grow abundantly. The climate is pleasant and we always have brilliant sunshine.

Veena Mark (age 16),
Nasar Building,
Mayo Road,
Lahore, West Pakistan.

Postmarks

DEAR EDITOR—I collect postal slogans. These can give Post Office instructions, announce exhibitions and fairs, commemorate anniversaries and so on, advertise towns and tourist resorts, as well as ask people to save water, support campaigns, prevent accidents and so on.

If anybody else is interested and would like to swap some, please write to me.

Jennifer Gough (age 14),
34 St Annes Drive,
Herne Bay, Kent.

How much do you know about the 18th century?

1. What were the first and last years of the 18th century?
2. Dr Johnson was the great literary figure of the century. Who wrote his *Life*?
3. In 1715 the king who had reigned longer than any other European monarch died. Who was he, and how long did he reign?
4. The history of modern cricket is said to date from the Hambledon men of the 1770's. What shape was their bat and how were the stumps arranged?
5. What was 'the year of victories' and why was it outstanding?
6. A type of road surface still used today is called after an 18th-century road engineer. Who was he?
7. Who composed the famous oratorio *Messiah*?
8. There were no aeroplanes in the 18th century, but the Montgolfier brothers used . . . . Can you fill the gap?
9. Britain had three kings with the same name during this century. Who were they and to what house did they belong: Stuart, Hanover or Windsor?
10. Every year July 4th and July 14th are celebrated. What 18th-century events do they commemorate, and what were the years in which these events took place?
11. Where can you still see Martello Towers, and why were they built?

ANSWERS

1. 1701; 1800.
2. James Boswell.
3. Louis XIV of France; 72 years.
4. Bats had curved, hockey stick ends; there were two upright stumps with one ball across the top.
5. 1759; victories were won at Minden, Lagos, Quiberon Bay and Quebec (Seven Years War).
6. John Loudon McAdam.
7. Handel.
8. Balloons.
9. George I, II and III; Hanover.
10. July 4th, Declaration of American Independence, 1776; July 14th, Fall of the Bastille, 1789.
11. Along the shores of Kent and Sussex; as a defence against possible French invasion. (Copied from one captured only with great difficulty on Cape Mortella, Sicily, in 1793.)

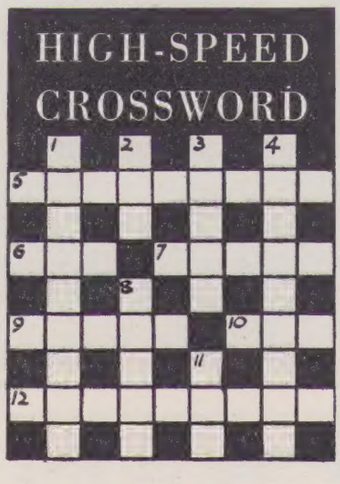
BRAIN ? BOX

1. BLOOM (——; ——) FARINACEOUS POWDER
   STAIRS (——; ——) RUSSIAN PLAINS
   POUR (——; ——) GROUP WORKING TOGETHER
   Into each set of brackets put two words; they are pronounced the same but spelt differently. A clue to each one is outside the brackets.
2. 1×2 equals 2; 15 squared is 225;
   2×3 equals 6; 25 squared is 625;
   3×4 equals 12; 35 squared is 1,225;
   4×5 equals 20; 45 squared is 2,025.
   What is 85 squared?
   Quick, now, no paperwork.
3. The Rat, the Cat, and Lovel, our dog,
   Rule all England under the hog.
   Can you explain this old historical rhyme?

ANSWERS

1. FLOWER, FLOUR; STEPS, STEPPES; TEEM, TEAM.
2. 7,225 (using the same system as the examples given: 8×9 equals 72; 85 squared is 7,225).
3. The 'hog' was Richard III (remember his hunched back); the three characters of the first line being Sir Richard RATCliffe; William CATesby; and Francis Lovel, Richard's three favourites. (Note: Lovel was a name commonly given to pet dogs.)

HIGH-SPEED CROSSWORD



Clues Across

5. Comfortable articles of furniture (9).
6. A definite article (3).
7. Put through clean water on washday (5).
9. —— and stripes (5).
10. Easter token (3).
12. Obtaining (9).

Clues Down

1. Designer of buildings (9).
2. The highest, or the lowest, card (3).
3. Roman tongue (5).
4. Rough recruiting officers (5-4).
8. Arrogant (5).
11. Historical age (3).

Solution next week.

SOLUTION TO LAST WEEK'S CROSSWORD

ACROSS: 1, Spy; 3, Cable; 6, Yes; 8, Heath; 11, Plead; 12, Awe; 13, Orb; 14, Never; 16, Today; 18, Eat; 20, Greet; 21, Ate.

DOWN: 2, Pie; 4, Area; 5, Let; 6, Yeast; 7, Spend; 8, Heavy; 9, Adore; 10, Habit; 15, Ease; 17, Our; 19, Act.

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Prehistoric sculpture

We can imagine how even the most primitive man might have scratched the rough outlines of animals on the wall of his cave, or perhaps (like boys today) carved shapes on trees, and whittled away at scraps of wood and bone. As with his paintings, he may have hoped to gain power over the figures that were represented, and from the earliest times these works were closely connected with magic and religion.

Palaeolithic head of a woman, in ivory; one of the most ancient sculptures in existence (Museum of National Antiquities, St Germain-en-Laye)

EGYPTIAN SCULPTURE

The Egyptians made and used their sculptures for a definite purpose. They believed that when their king died, his soul could live on if a likeness of him was kept. A portrait of him was carved out of stone and put with his body in the tomb. Egyptian sculpture on a larger scale has been preserved for us in the form of colossal sphinxes, carved out of single blocks of stone. Egyptian art changed and developed hardly at all in several thousand years.

Far left: Mesopotamian stone figure (3rd millennium B C).

Left: Egyptian wood carving showing official of Memphis with his wife (2500 B C; Louvre, Paris)

Wooden head, resembling the Pharaoh Ikhnaton (14th century B C; Louvre, Paris)

Greek art

Sculpture in Ancient Greece was mainly religious: statues and reliefs were used to decorate temples and monuments, and to commemorate victories both in war and in athletics.

After their contact with Egypt and Mesopotamia in the latter half of the 7th century B C, Greek sculptors show the Eastern influence in, for example, the rigid stances of the standing and seated figures which were so characteristic of Egyptian art. But unlike Egyptian sculpture, that of the Greeks shows a steady development.

During the 6th century B C we see a trend towards more detailed and

A Roman copy in marble of the Greek Praxiteles's Artemis (345 B C; Louvre, Paris)

5th-century relief, Athens

Head of a woman in marble (240 B C; National Museum, Athens)

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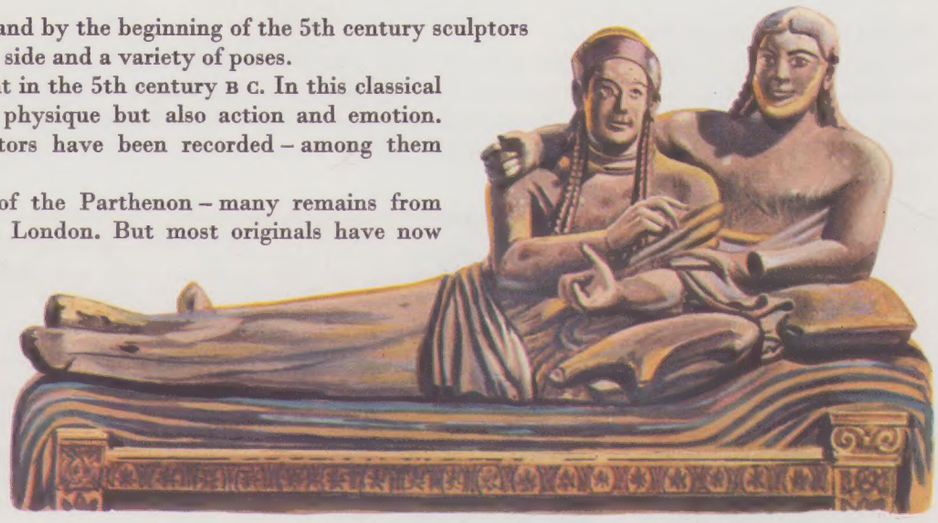
naturalistic representation of the human body, and by the beginning of the 5th century sculptors were starting to show heads held slightly on one side and a variety of poses.

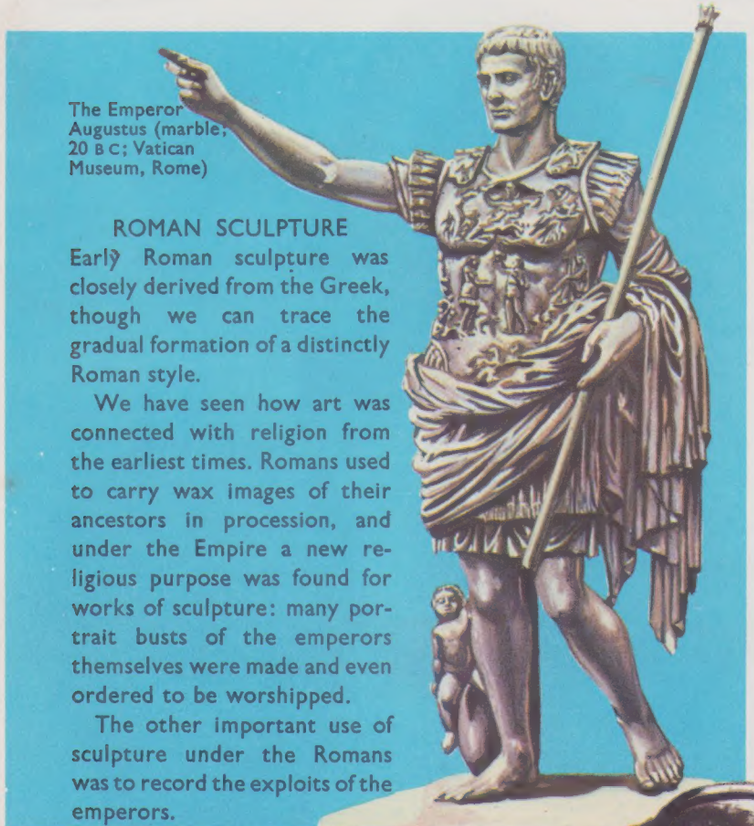
Greek art and civilisation reached their height in the 5th century B C. In this classical period sculptors strove to represent not only physique but also action and emotion. The names of some famous individual sculptors have been recorded – among them Pheidias, Polykleitos, and Praxiteles.

Pheidias was responsible for the sculpture of the Parthenon – many remains from which can be seen in the British Museum, in London. But most originals have now been lost, and much of our knowledge of Greek sculpture has been derived from later copies.

By the end of the 2nd century B C the pointing method of making copies was being used to make reproductions of original Greek sculptures to take to Rome. We know little of early Italian art itself, though some Etruscan works have survived. These again show a close connection with religious rites and with death.



Etruscan terracotta sarcophagus (550 B C; Villa Giulia, Rome)



The Emperor Augustus (marble; 20 B C; Vatican Museum, Rome)

ROMAN SCULPTURE

Early Roman sculpture was closely derived from the Greek, though we can trace the gradual formation of a distinctly Roman style.

We have seen how art was connected with religion from the earliest times. Romans used to carry wax images of their ancestors in procession, and under the Empire a new religious purpose was found for works of sculpture: many portrait busts of the emperors themselves were made and even ordered to be worshipped.

The other important use of sculpture under the Romans was to record the exploits of the emperors.

Far left: a Roman bas-relief; left: a Roman marble head, about 40 B C

Early Christian sculpture

For the first 200 years after the birth of Christ, Christians had to practise their religion in secret, meeting in private houses or in the catacombs. In the reign of the Emperor Constantine, Christianity was officially recognised and persecution ceased. The new capital of the Empire, Constantinople, was founded in 330. Christian painters, architects, and sculptors were able to emerge, and churches began to be built. Sculpture did not play such a prominent part in the art of this period as it had done in classical times; a large proportion of it was done on a small scale in ivory or precious stone.

Stone sculpture shows in general a continuation of the Roman Imperial style – modified, of course, to suit the new Christian stories and symbols. The great aim of Christian sculptors was to illustrate the Bible and propagate their religion as clearly and simply as possible, so that uneducated people would be able to understand it.

The Good Shepherd (4th century A D; Lateran Museum, Rome)

Carved ivory chair (6th century A D; Ravenna)